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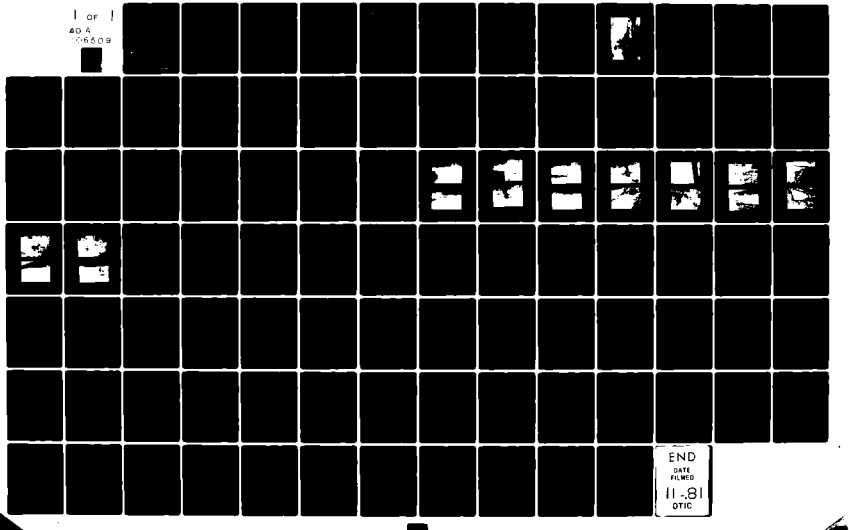

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MISSOURI-KANSAS CITY BASIN

AD A106509

LAKE CYRENE DAM
BOONE COUNTY, MISSOURI
MO 11596

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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FOR: STATE OF MISSOURI

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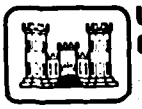
MISSOURI-KANSAS CITY BASIN

LAKE CYRENE DAM

BOONE COUNTY, MISSOURI

MO 11596

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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PREPARED BY: U.S. ARMY ENGINEER DISTRICT. ST. LOUIS

FOR: STATE OF MISSOURI

MARCH 1981

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO ATTENTION OF

SUBJECT: Lake Cyrene Dam, (MO 11596)
Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Lake Cyrene Dam (MO 11596).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

a. Spillway will not pass 50 percent of the Probable Maximum Flood without overtopping the dam.

b. Overtopping of the dam could result in failure of the dam.

c. Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED
Chief, Engineering Division
22 JUL 1981
Date

APPROVED BY: SIGNED
Colonel, CE, Commanding
23 JUL 1981
Date

LAKE CYRENE DAM

BOONE COUNTY, MISSOURI

MISSOURI INVENTORY NO. 11596

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY:

BLACK & VEATCH
CONSULTING ENGINEERS
KANSAS CITY, MISSOURI

UNDER DIRECTION OF

ST. LOUIS DISTRICT CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

MARCH 1981

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Lake Cyrene Dam
State Located	Missouri
County Located	Boone County
Stream	Tributary to Hinkson Creek
Date of Inspection	11 March 1981

Lake Cyrene Dam was inspected by a team of engineers from Black & Veatch, Consulting Engineers for the St. Louis District, Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and state agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. According to the St. Louis District, Corps of Engineers, failure would threaten lives and property. The estimated damage zone extends approximately two miles downstream of the dam. Within the estimated damage zone are four dwellings, one building, three apartment buildings, a gasoline station, a trailer court consisting of approximately 15 trailers, and the junction of Highways 740 and 63. Contents of the estimated downstream damage zone were verified by the inspection team.

Our inspection and evaluation indicates the spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The spillways will not pass the probable maximum flood without overtopping but will pass 10 percent of the probable maximum flood. The spillways will not pass the flood which has a one percent chance of occurrence in any given year (100-year flood), but will pass the flood with a 10 percent chance of occurrence (10-year flood). The spillway design flood recommended by the guidelines is 50 to 100 percent of the probable maximum flood. Considering the hazard zone and the reservoir storage volume, the spillway design flood should be 100 percent of the probable maximum flood. The probable maximum flood is defined as the flood discharge which may be expected from the most severe combination of critical meteorologic and hydrologic conditions which are reasonably possible in the region.

Based on visual observations, this dam appears to be in less than satisfactory condition. Deficiencies visually observed by the inspection team were erosion and sloughing of the upstream face, seepage on the downstream face, trees growing on the embankment and animal burrows on the embankment. Seepage and stability analyses required by the guidelines were not available.

There were no observed deficiencies or conditions existing at the time of the inspection which indicated an immediate safety hazard. Future corrective action and regular maintenance will be required to correct or control the described deficiencies. In addition, detailed seepage and stability analyses of the existing dam, as required by the guidelines, should be performed. A detailed report discussing each of these deficiencies is attached.

Edwin R. Burton, PE
Missouri E-10137

Harry L. Callahan, Partner
Black & Veatch

OVERVIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE CYRENE DAM

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SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the District Engineer of the St. Louis District, Corps of Engineers, directed that a safety inspection of the Lake Cyrene Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth structure located in the valley of a tributary to Hinkson Creek, (See Plate 1). The watershed is an area of low hills with fairly steep slopes which is totally developed as a residential area. The dam is approximately 670 feet long along its crest. Its alignment forms a "Z". The embankment height is 25 feet from its crest to the toe of slope at its highest point. The crest width is about 10 feet. The downstream face of the dam has a nonuniform slope from the crest to the valley floor below.

(2) The principal spillway is a 36-inch corrugated metal pipe drop inlet connected to an 18-inch corrugated metal pipe through the dam. The pipe outlet is downstream of the dam and discharges into a small pond then to the natural stream below.

(3) The emergency spillway is a grass lined, open channel cut through the natural abutment at the left end of the dam. (Left or right as used herein is referenced while looking in a downstream direction.) The spillway channel is trapezodial with a bottom width of about 7 feet. There is a low berm constructed along the right bank to prevent flow across the downstream slope of the embankment. The emergency spillway discharges onto a wooded hillside downstream of the dam.

(4) Pertinent physical data are given in paragraph 1.3.

b. Location. The dam is located in the eastern part of the City of Columbia in central Boone County, Missouri, as indicated on Plate 1. The lake formed by the dam is shown on the United States Geological Survey 7.5 minute series quadrangle map for Columbia, Missouri in Section 19 of T48N, R12W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, the dam and impoundment are in the small size category. A small size dam is classified as having a height less than 40 feet, but greater than or equal to 25 feet and/or a storage capacity less than 1,000 acre-feet, but greater than or equal to 50 acre-feet. Lake Cyrene Dam is 25-feet high with a normal storage volume of 50 acre-feet.

d. Hazard Classification. The hazard classification assigned by the Corps of Engineers for this dam is as follows: The Lake Cyrene Dam has a high hazard potential, meaning that the dam is located where failure may cause loss of life, and serious damage to homes, agricultural, industrial and commercial facilities, and to important public utilities, main highways, or railroads. For the Lake Cyrene Dam the estimated flood damage zone extends approximately two miles downstream of the dam. Within the estimated damage zone are four dwellings, one building, three apartment buildings, a gasoline station, a trailer court with approximately 15 trailers, and the junction of Highways 740 and 63. Contents of the estimated downstream damage zone were verified by the inspection team.

e. Ownership. The dam is owned by the Lake Cyrene Corporation, 1132 Business Highway 63 South, Columbia, Mo. 65201, c/o William Platt, President.

f. Purpose of Dam. The dam forms a 6.3-acre lake used for recreation.

g. Design and Construction History. Data relating to the design and construction were not available. According to Mr. William Platt, president of the Lake Cyrene Corporation, the dam was built in the 1930's and provided water for dairy farming operations.

h. Normal Operating Procedure. Normal rainfall, runoff, transpiration, evaporation, and overflow through the uncontrolled spillway all combine to maintain a relatively stable water surface elevation.

1.3 PERTINENT DATA

a. Drainage Area - 64 acres

b. Discharge at Damsite.

(1) Normal discharge at the damsite overflows to a 36-inch diameter corrugated metal pipe drop inlet to an 18-inch diameter corrugated metal pipe.

(2) Estimated experienced maximum flood at damsite - Unknown.

(3) Estimated ungated spillway capacity at maximum pool elevation 110 cfs (Probable Maximum Flood Pool El. 686.5).

c. Elevation (Feet above m.s.l. Approximate Tie to USGS Map).

(1) Top of dam - 685.5 (see Plates 3 & 4)

(2) Principal spillway crest - 684.0

(3) Streambed at toe of dam - 660.3

(4) Maximum tailwater - Unknown.

d. Reservoir.

(1) Length of maximum pool - 700 feet ± (Probable maximum flood pool level)

(2) Length of normal pool - 625 feet ± (Principal spillway crest)

e. Storage (Acre-feet).

(1) Top of dam - 60

(2) Principal spillway crest - 50

(3) Design surcharge - Not available.

f. Reservoir Surface (Acres).

(1) Top of dam - 6.8

(2) Principal spillway crest - 6.3

g. Dam.

(1) Type - Earth embankment

(2) Length - 670 feet

(3) Height - 25 feet ±

(4) Top width - 10 feet

(5) Side slopes - upstream face 1.0 V on 2.3 H, downstream face between 1.0 V on 2.5 H and 1.0 V on 6.7 H (see Plate 4)

(6) Zoning - Unknown.

(7) Impervious core - Unknown.

(8) Cutoff - Unknown.

(9) Grout curtain - Unknown.

h. Diversion and Regulating Tunnel - None.

i. Principal Spillway.

(1) Type - 36-inch diameter CMP drop inlet with 18-inch diamter CMP through the dam.

(2) Inlet crest elevation - 684.0 feet m.s.l.

(3) Inlet invert elevation - 677.7.

(4) Outlet invert elevation - 669.8 feet m.s.l.

(5) Gates - None.

(6) Upstream channel - None.

(7) Downstream channel - Spillway discharges to a small pond downstream of the dam then to the natural stream below.

j. Emergency Spillway.

(1) Type - Grass lined open channel.

(2) Crest Elevation - 684.6 feet m.s.l.

(3) Gates - None.

(4) Upstream Channel - Grass-lined approach channel.

(5) Downstream Channel - Spillway, discharges to wooded hillside then to a small pond downstream of the dam then to stream below.

k. Regulating Outlets - None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Design data were not available.

2.2 CONSTRUCTION

Construction records were unavailable.

2.3 OPERATION

Operational records and documentation of past floods were unavailable.

2.4 GEOLOGY

The site of the dam and reservoir is located across a broad, moderately steep sided valley. The dam impounds the drainage from an intermittent tributary of Hinkson Creek.

The soil in the dam and reservoir area consists of Union silt loam and silty clay loam. The Union series consists of moderately well drained soils formed in loess over cherty residuum weathered from limestone. The upper 8 inches of this series is classified for engineering purposes as clayey silt to silty clay (Unified Classification CL-ML to CL). The remaining part of the soil profile is classified as silty clay (CL) with clayey sand (SC), clayey gravel (GC) and highly plastic clay (CH) present below a depth of 40 inches. Bedrock of the area consists of Mississippian age cherty, crinoidal limestones of the Osagean Series. Depth to bedrock could not be determined visually at the site but is assumed to be greater than 5 feet based on Soil Conservation Service information.

2.5 EVALUATION

a. Availability. No engineering data were available.

b. Adequacy. No engineering data were available. Thus, an assessment of the design, construction, and operation could not be made. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. The validity of the design, construction, and operation could not be determined due to the lack of engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of Lake Cyrene Dam was made on 11 March 1981. The inspection team consisted of Edwin Burton, team leader; Shannon Casey, geologist; Gary Van Riessen, geotechnical engineer; and John Ruhl, hydraulic/hydrologic engineer. The dam appeared to be sound but is in less than satisfactory condition due to erosion of the upstream face and trees and animal burrows on the embankment. Specific observations are discussed below. No observations were made of the condition of the upstream face of the dam below the pool elevation at the time of the inspection.

b. Dam. The inspection team observed the following conditions at the dam. There was no cracking or evidence of sliding of the embankment slopes. The dam crest elevation was very irregular but there was no visible sign that the dam had ever been overtopped. Mr. Platt, who has lived in the residence at the right end of the dam for over ten years, stated that he has no knowledge of the dam ever being overtopped.

The water line along the upstream face and the slope of the upstream face are very irregular due to wave action erosion and sloughing, a condition that is aggravated by burrowing animals, (muskrat). The upstream face has riprap slope protection; which is located at an elevation lower than the principal spillway inlet and the erosion and sloughing is taking place above the riprap, (Photo 15). Several large animal burrows (Photo 14), probably groundhog, were observed on the downstream face of the dam. An area of nonflowing seepage was observed on the downstream slope (Photo 7) and below the downstream toe near and to the right of an abandoned pumphouse. The seepage was evidenced by the abundant growth of cattails and aquatic plants. Another possible seepage area exists on the right abutment downstream of the dam. Mr. Platt indicated that this area stays wet most of the time. This area did not appear to be unusually wet to the inspection team; however, the lake level was low on the day of inspection. There are many trees growing on both faces of the embankment, (Photos 6, 7 and 15) some with trunks as large as 12 to 14 inches. A row of poplar trees 2 to 4 inches have been planted along the downstream edge of the crest. Erosion protection on the crest and downstream face consist of a good grass cover with some weeds.

c. Appurtenant Structures. Appurtenant structures observed by the inspection team include the principal spillway, the emergency spillway, and the old pump house.

The principal spillway is a 36-inch corrugated metal pipe drop inlet to a 18-inch corrugated metal pipe through the embankment. The

drop inlet has a welded steel bar trash screen at the inlet crest, (Photo 8). Only the inlet and about two feet of the pipe at the outlet end where observable. The pipe alignment was observed by looking through the pipe from the outlet end. The pipe appeared to turn up slightly at about 30 feet from the outlet. There appeared to be a slight crimp at the crown of the pipe at the point where it turned up. The pipe and drop inlet were of sound metal with some surface rust. There was no flow through the pipe at the time of the inspection.

The emergency spillway is an open channel cut through natural material of the left abutment. No signs of erosion of the emergency spillway were observed. The channel floor and banks were protected by a good dense cover of grass. The channel is non-uniform in slope and cross section. The emergency spillway channel ends at a brush and tree covered slope about 75 feet downstream from the dam, (Photo 13).

There is no development in the spillway areas which would suffer damage due to flow through the spillways. High flows through the emergency spillway may overflow the protective berm onto the downstream slope of the dam.

An old pumphouse (Photo 17) was located downstream of the dam just beyond the toe of slope, (Plate 3). The pumphouse contained a pump and valves which appeared to have not been used for many years. The interior of the pumphouse was dry. Connecting piping to the pump and valves was not observable. There appeared to be no electrical connections to the pumphouse.

d. Geology. The soils surrounding the dam and reservoir consist of clayey silt to silty clay (CL-ML, to CL) to a depth of 8 inches, overlying silty clay (CL), with clayey sand (SC), clayey gravel (GC) and highly plastic clay (CH) present below a depth of 40 inches. The foundation of the dam is silty clay (CL) to clayey silt (CL-ML) as are both abutments. The emergency spillway was cut through the same material.

Based on visual examination of auger samples taken near the crest of the dam, the embankment material consists of silty clay (CL).

e. Reservoir Area. No slumping or slides of the reservoir banks were observed. The lake was noted to be clean with no siltation.

f. Downstream Channel. The principal spillway discharges to a small pond, then to the natural stream. The emergency spillway discharges to a brush and tree covered slope, then to a small pond and to the natural stream below. The natural stream is tree lined and leads to a culvert under Highways 740 and 63.

3.2 EVALUATION

The various deficiencies observed at the time of the inspection are not believed to represent an immediate safety hazard. They do, however, warrant monitoring and control or repair.

It is believed by the inspection team that the erosion and sloughing of the upstream face is due to wave action when the lake level is higher than the riprap. This condition will continue to worsen as long as the water level is allowed to rise above the slope protection.

The growth of trees and brush and the uncut grass, if allowed to go unchecked, could cause deterioration of the embankment. The roots of trees can loosen the embankment material and also can leave voids through which water can pass. Brush on the dam prevents inspection of the embankment and kills the smaller grasses whose roots are more effective in protecting the surface soil of the slope from erosion. The brush and tall uncut grass provides habitat for burrowing animals which can damage the embankment.

The area of seepage on the downstream slope which was observed should be monitored regularly for quality and quantity. Seepage can cause internal erosion creating cavities and underground channels, thereby weakening the embankment and/or abutments. It is believed that the wet area on the right abutment is seepage through an old spillway channel that has been filled. If so, it probably does not constitute a safety deficiency but is a nuisance.

Burrowing animals will continue to damage the embankment if no program is undertaken to eliminate them. Piping failure of the embankment has resulted in similar small earth dams due to burrowing animal damage.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The pool is primarily controlled by rainfall, runoff, evaporation, transpiration, and capacity of the uncontrolled spillway.

4.2 MAINTENANCE OF DAM

The only maintenance evident was that the grass on the crest of the dam had been mowed and trees had been removed from under the power-line that crosses a part of the downstream slope. Mr. Platt indicated that the residents of the lake area mow the crest and that the power company has removed trees along its right of way. He also indicated that silt had been removed from the lake area by dredging.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no existing warning system or preplanned scheme for alerting downstream residents for this dam.

4.5 EVALUATION

The existing maintenance effort has not been adequate in preserving the dam in a satisfactory condition.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. No design data were available.

b. Experience Data. The drainage area and lake surface area are developed from USGS Columbia (1967, Photo revised 1974), Mo. Quadrangle Map. The dam layout is from a survey made during the inspection.

c. Visual Observations.

(1) The principal spillway appears to be in good condition. The lake level at the time of the inspection (El. 681.1) was below the principal spillway pipe inlet. There were no obstructions to flow in the downstream channel. The existence of the steel grate at the top of the inlet has no appreciable effect on discharge through the principal spillway.

(2) The emergency spillway for this dam consists of a grass-lined open channel cut through the left abutment.

(3) Excessive discharges through the emergency spillway could endanger the integrity of the dam, due to potential for overflow across downstream embankment slope.

d. Overtopping Potential. The spillways will not pass the probable maximum flood without overtopping the dam. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The spillways will pass 10 percent of the probable maximum flood without overtopping the dam. The spillways will not pass the one percent chance flood (100-year flood) developed from a 24-hour, one percent chance rainfall, but will pass the 10 percent chance flood (10-year flood) developed from a 24-hour, 10 percent chance rainfall. According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, a high hazard dam of small size should pass 50 to 100 percent of the probable maximum flood. Considering the downstream hazard, the appropriate spillway design flood should be 100 percent of the probable maximum flood. The portion of the estimated peak discharge of 50 percent of the probable maximum flood overtopping the dam would be 506 cfs of the total discharge from the reservoir of 592 cfs. The estimated duration of overtopping is 5.2 hours with a maximum height of 0.7 feet. The portion of the estimated peak discharge of the probable maximum flood overtopping the dam would be 1,105 cfs of the total discharge from the reservoir of 1,215 cfs. The estimated duration of overtopping is 6.4 hours with a maximum height of 1.0 feet. The embankment could be jeopardized should overtopping occur for these periods of time.

According to the St. Louis District, Corps of Engineers, the effect from rupture of the dam could extend approximately two miles downstream of the dam. Four dwellings, one building, three apartment buildings, a gasoline station, a trailer court consisting of approximately 15 trailers, and the junction of Highways 740 and 63 are located within the estimated damage zone, and lives could be lost should failure of the dam occur. Contents of the estimated downstream damage zone were verified by the inspection team. Lake Cyrene Dam and the downstream damage zone lie within the City of Columbia. Floodplain development below the dam is regulated by the city in accordance with the requirements of the Flood Insurance Program.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Visual observations of conditions which affect the structural stability of this dam are discussed in Section 3, paragraph 3.1b.

b. Design and Construction Data. No design data relating to the structural stability of the dam were found. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Operating Records. No operational records exist.

d. Postconstruction Changes. According to Mr. William Platt, in 1970 a rock lined spillway channel through the right abutment was filled in with clay and a drop inlet and 18-inch pipe was installed through the dam. At a later date, the inlet crest of the drop inlet was raised by adding a section of corrugated metal pipe to the top of the drop inlet.

e. Seismic Stability. The dam is located in Seismic Zone 1 which is a zone of minor seismic risk. A properly designed and constructed earth dam using sound engineering principles and conservatism should pose no serious stability problems during earthquakes in this zone. The seismic stability of an earth dam is dependent upon a number of factors: embankment and foundation material classifications and shear strengths; abutment materials, conditions, and strengths; embankment zoning; and embankment geometry. Adequate descriptions of embankment design parameters, foundation and abutment conditions, or static stability analyses to assess the seismic stability of this embankment were not available and therefore no inferences will be made regarding the seismic stability. An assessment of the seismic stability should be included as part of the stability analysis required by the guidelines.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. Several conditions observed during the visual inspection by the inspection team should be corrected or monitored and controlled. These are erosion and sloughing on the upstream face, seepage on the downstream slope, the growth of and trees on both the upstream and downstream faces of the dam, and animal burrows in the embankment. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

b. Adequacy of Information. Due to the absence of engineering design data, the conclusions in this report were based only on performance history and visual conditions. The inspection team considers that these data are sufficient to support the conclusions herein. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency. It is the opinion of the inspection team that a program should be developed as soon as possible to implement remedial measures recommended in paragraph 7.2b. If the safety deficiencies listed in paragraph 7.1a are not corrected, they will continue to deteriorate and lead to a serious potential of failure. The item recommended in paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II. The Phase I investigation does not raise any serious questions relating to the safety of the dam nor does it identify any serious dangers which would require a Phase II investigation. However, the additional analyses noted in paragraph 2.5b are necessary for compliance with the guidelines.

e. Seismic Stability. This dam is located in Seismic Zone 1. Adequate description of embankment design parameters, foundation and abutment conditions, or static stability analyses to assess the seismic stability of this embankment were not available and therefore no inferences will be made regarding the seismic stability. An assessment of the seismic stability should be included as part of the recommended stability analysis.

7.2 REMEDIAL MEASURES

a. Alternatives. Spillway capacity and/or the reservoir storage volume would need to be increased or the lake level would need to be permanently lowered to increase available flood storage in order to

effectively pass the spillway design flood. Spillway capacity could be increased by modifying the existing grass-lined emergency spillway or by increasing the principal spillway pipe size. The storage volume could be increased by raising the crest of the dam or by lowering the lake level by lowering the principal spillway inlet.

b. Operation and Maintenance Procedures. The following operation and maintenance procedures are recommended and should be carried out under the direction of a professional engineer experienced in the design, construction, and maintenance of earth dams.

(1) The erosion and sloughing on the upstream face should be repaired and the slope redress. Riprap should be placed on the upstream face to an elevation above normal lake level to prevent erosion of the embankment material.

(2) The seepage areas noted during the visual inspection should be closely monitored and documented as to quantity and quality of flow. Any significant changes should be evaluated.

(3) A maintenance program should be formulated and implemented to remove and control the growth of trees on the embankments. Grass/weed cover on the embankments should be cut periodically.

(4) The animal burrows in the embankment should be repaired since they can contribute to the occurrence of piping. Control measures should be implemented to discourage animal activity in the area. The embankment slope should be monitored by a qualified engineer during repair of the embankment.

(5) Seepage and stability analyses should be performed.

(6) A detailed inspection of the dam should be made periodically and the findings of the inspections should be documented and made a matter of record. More frequent inspections may be required if additional deficiencies are observed or the severity of the reported deficiencies increase.

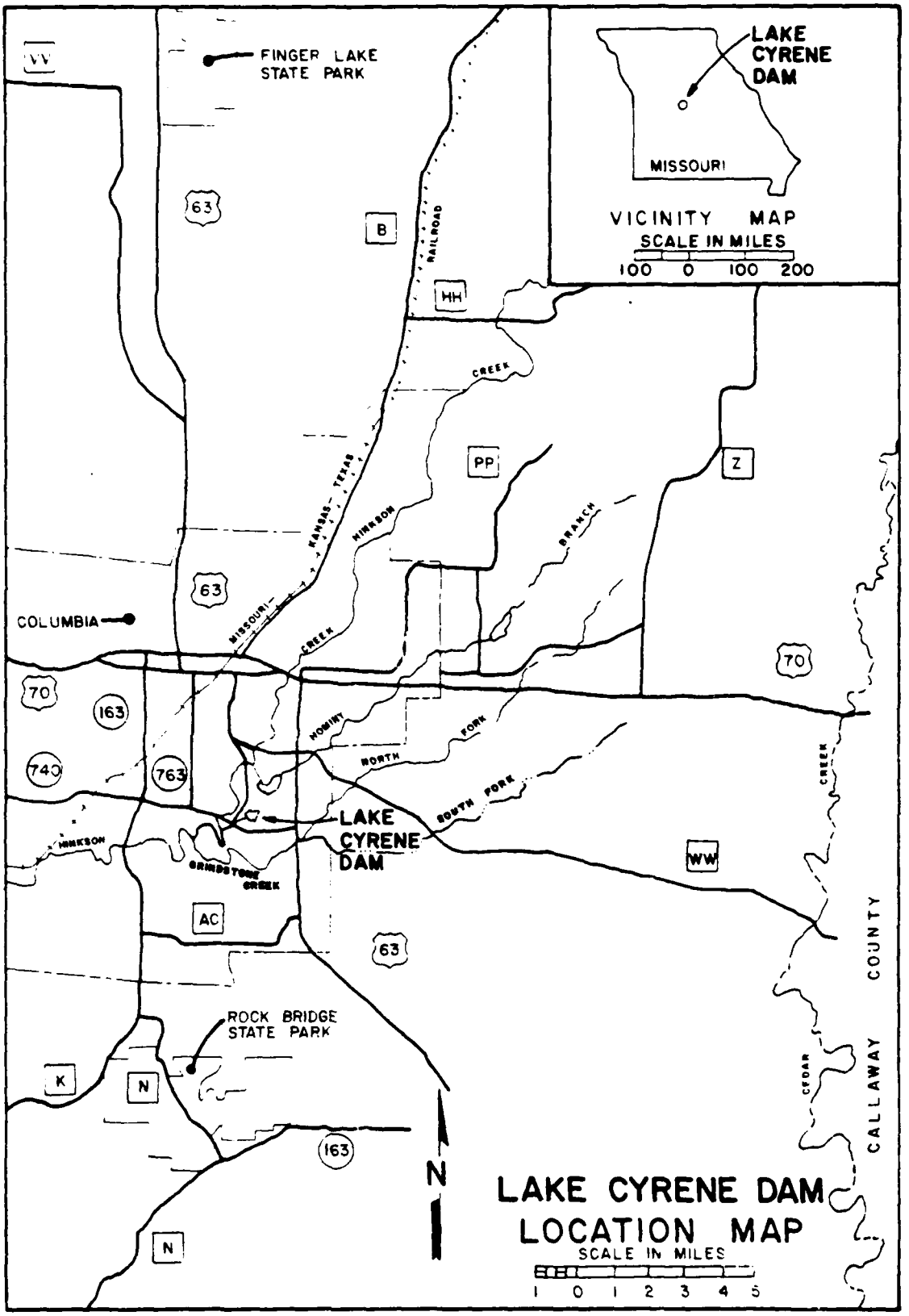

LAKE CYRENE DAM
MISSOURI
VICINITY MAP
SCALE IN MILES
100 0 100 200
FINGER LAKE STATE PARK
COLUMBIA
LAKE CYRENE DAM
ROCK BRIDGE STATE PARK
CALLAWAY COUNTY
N
LAKE CYRENE DAM LOCATION MAP
SCALE IN MILES
1 0 1 2 3 4 5

PLATE 1

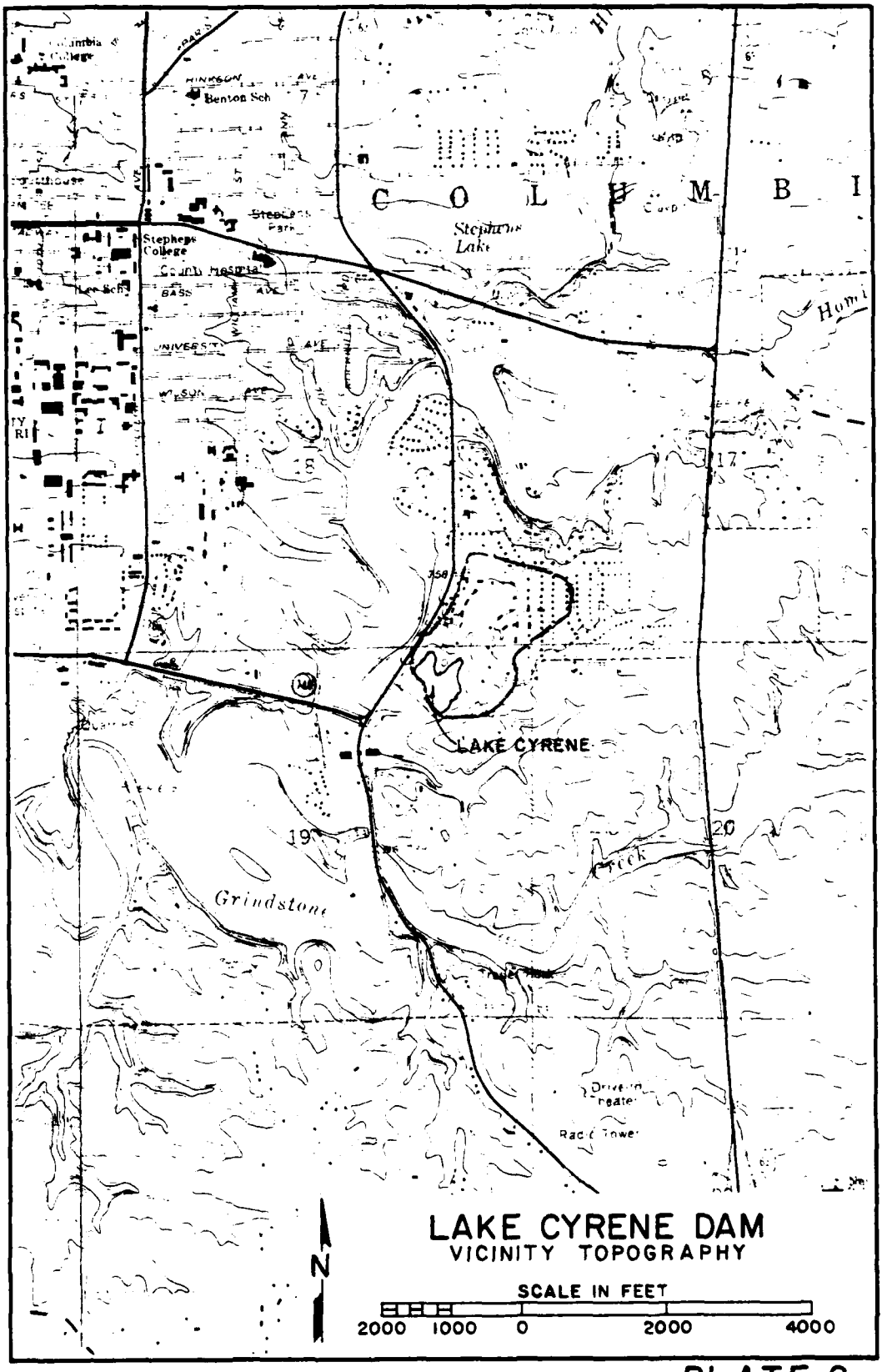

Benton Sch
Stephens College
C O L U M B I
Stephens Lake
LAKE CYRENE
Grindstone
Creek
N
LAKE CYRENE DAM
VICINITY TOPOGRAPHY
SCALE IN FEET
2000 1000 0 2000 4000

PLATE 2

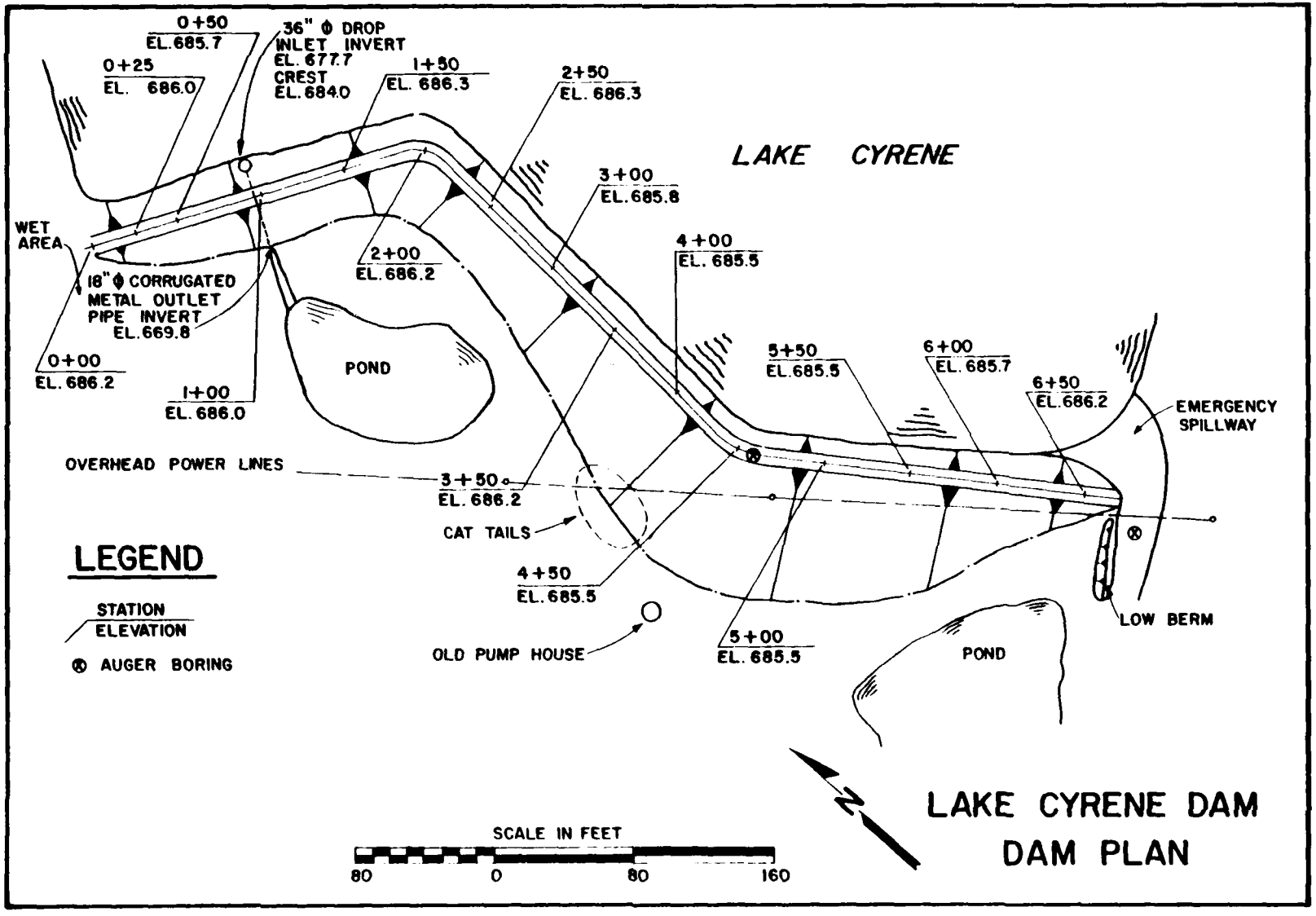

0+50
EL.685.7
36" ϕ DROP
INLET INVERT
EL. 677.7
CREST
EL. 684.0
0+25
EL. 686.0
1+50
EL. 686.3
2+50
EL. 686.3
LAKE CYRENE
3+00
EL. 685.8
WET
AREA
4+00
EL. 685.5
2+00
EL. 686.2
18" ϕ CORRUGATED
METAL OUTLET
PIPE INVERT
EL. 669.8
0+00
EL. 686.2
POND
1+00
EL. 686.0
5+50
EL. 685.5
6+00
EL. 685.7
6+50
EL. 686.2
EMERGENCY
SPILLWAY
OVERHEAD POWER LINES
3+50
EL. 686.2
CAT TAILS
LEGEND
STATION
ELEVATION
⊗ AUGER BORING
4+50
EL. 685.5
OLD PUMP HOUSE
5+00
EL. 685.5
POND
LOW BERM
N
SCALE IN FEET
80
0
80
160
LAKE CYRENE DAM
DAM PLAN

PLATE 3

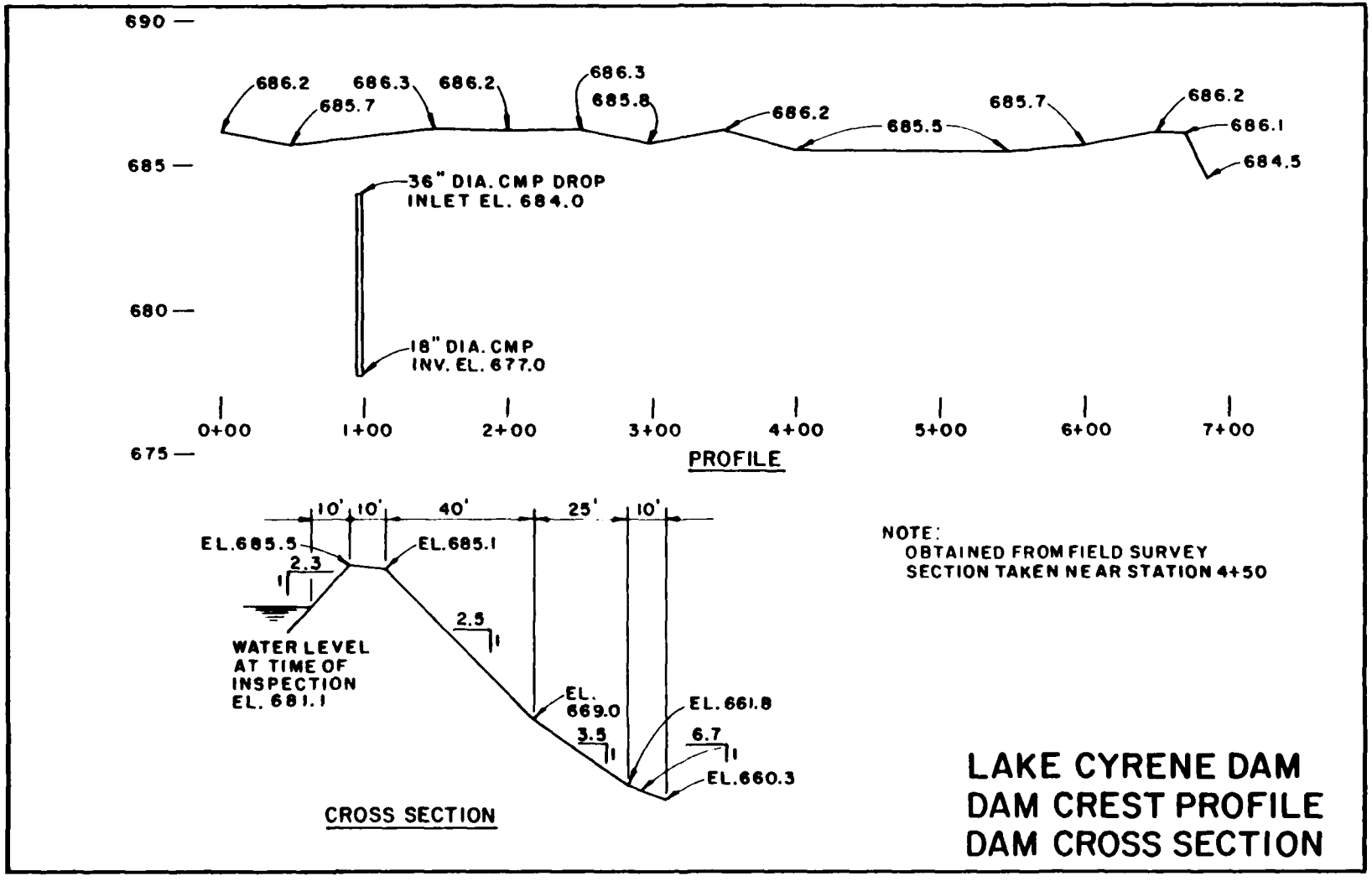
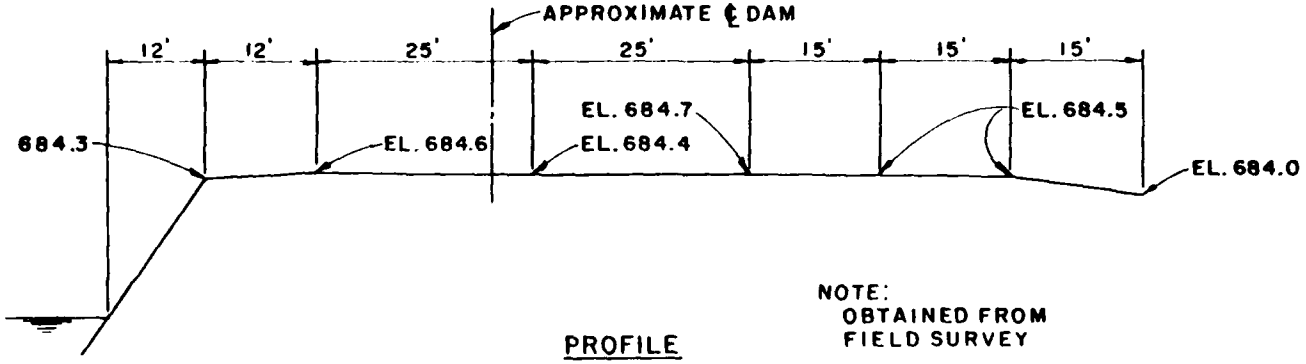
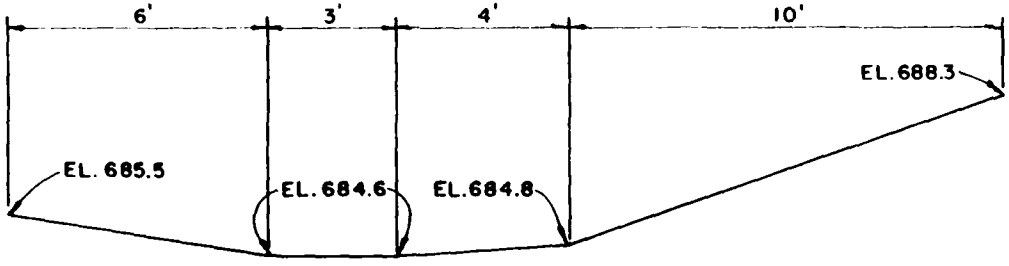

690
685
680
675
686.2
686.3
686.2
685.7
686.3
685.8
686.2
685.5
685.7
686.2
686.1
684.5
36" DIA. CMP DROP
INLET EL. 684.0
18" DIA. CMP
INV. EL. 677.0
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
PROFILE
10'
10'
40'
25'
10'
EL.685.5
EL.685.1
2.3
1
1
2.5
1
WATER LEVEL
AT TIME OF
INSPECTION
EL. 681.1
EL.
669.0
EL. 661.8
3.5
1
6.7
1
EL.660.3
CROSS SECTION
NOTE:
OBTAINED FROM FIELD SURVEY
SECTION TAKEN NEAR STATION 4+50
LAKE CYRENE DAM
DAM CREST PROFILE
DAM CROSS SECTION

PLATE 4



NOTE:
OBTAINED FROM
FIELD SURVEY

PROFILE



CROSS SECTION

NOTE:
SECTION NEAR STATION 0+74
OF SPILLWAY LOOKING UPSTREAM

PLATE 5

LAKE CYRENE DAM (MO 11596)
EMERGENCY SPILLWAY PROFILE
EMERGENCY SPILLWAY CROSS SECTION

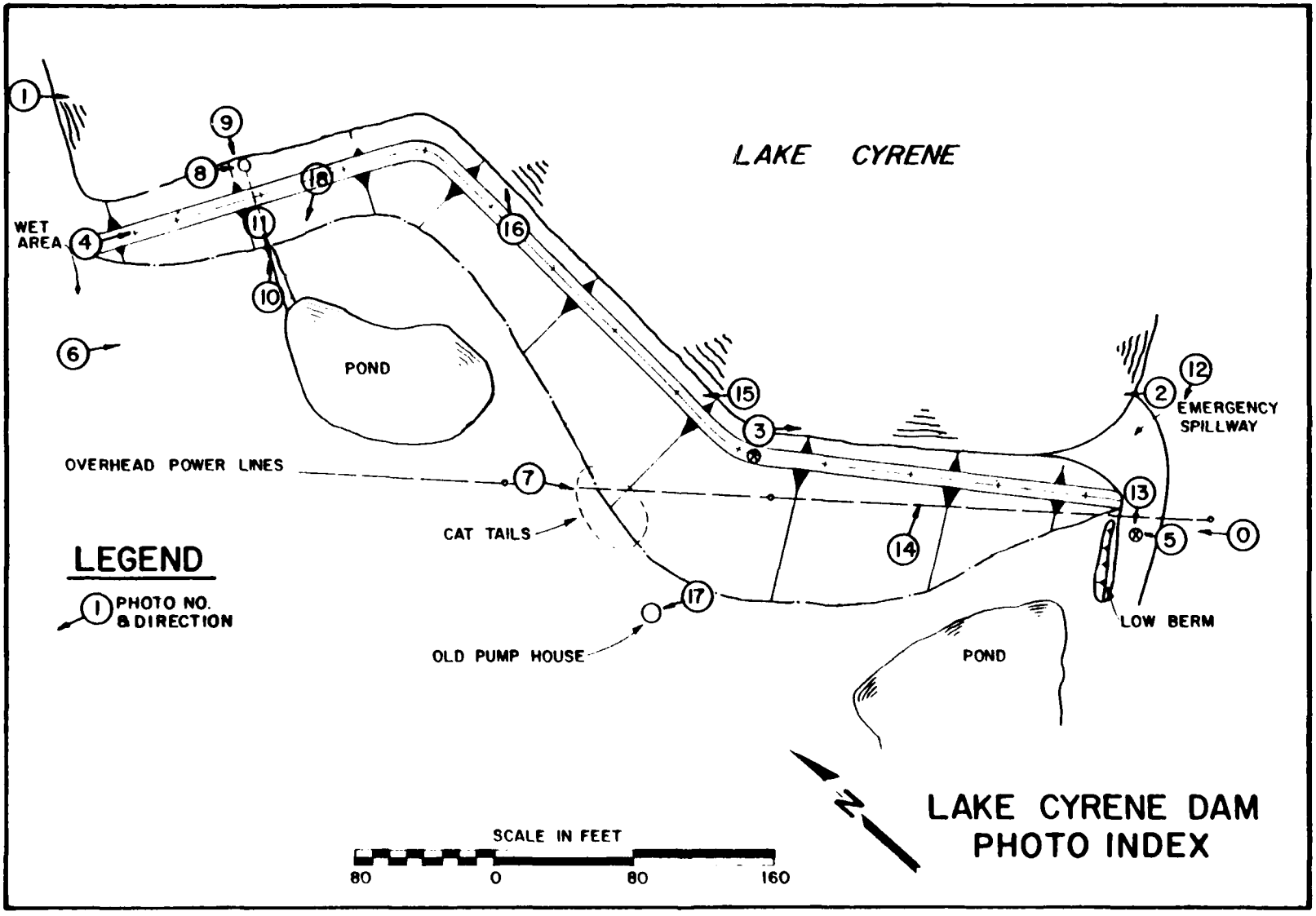

LAKE CYRENE
WET AREA
POND
OVERHEAD POWER LINES
CAT TAILS
OLD PUMP HOUSE
POND
EMERGENCY SPILLWAY
LOW BERM
LEGEND
1 PHOTO NO. & DIRECTION
SCALE IN FEET
80
0
80
160
N
LAKE CYRENE DAM
PHOTO INDEX

PLATE 6

PHOTO 1: UPSTREAM FACE OF DAM WEST END

PHOTO 2: UPSTREAM FACE OF DAM AT MID-DAM

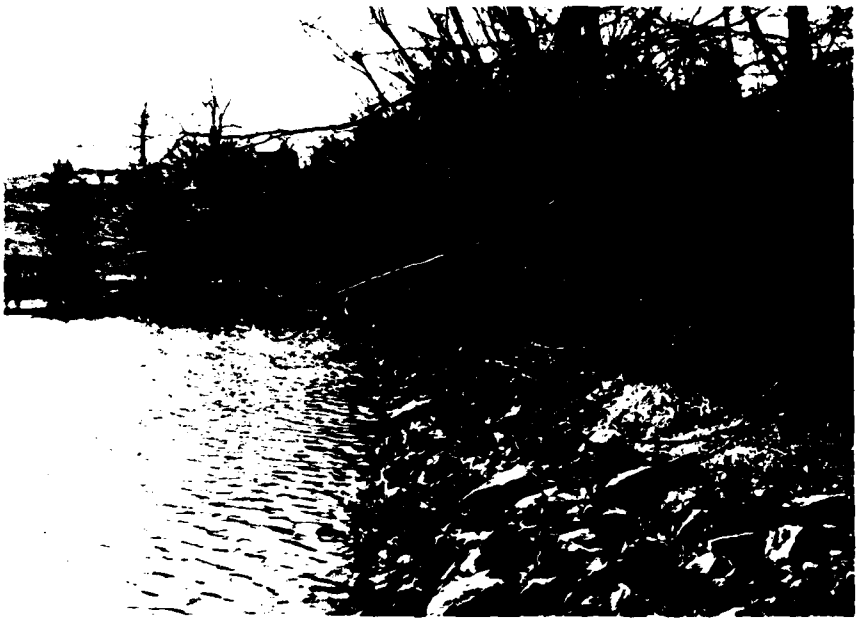


PHOTO 3: UPSTREAM FACE OF DAM EAST END

PHOTO 4: CREST OF DAM LOOKING EAST

PHOTO 5: CREST OF DAM LOOKING WEST

PHOTO 6: DOWNSTREAM FACE OF DAM LOOKING EAST

PHOTO 7: DOWNSTREAM FACE OF DAM [illegible]

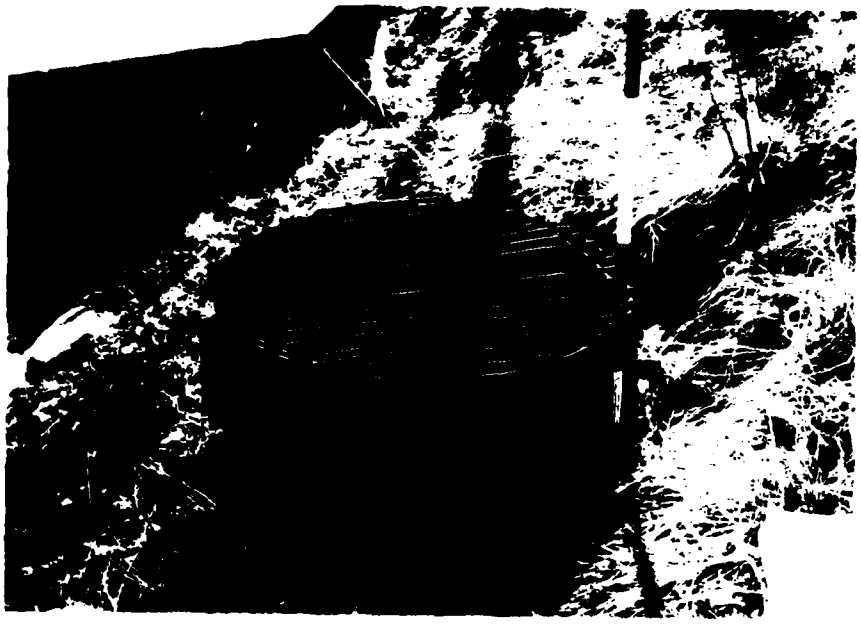


PHOTO 8: DROP INLET TO PRINCIPAL SPILLWAY

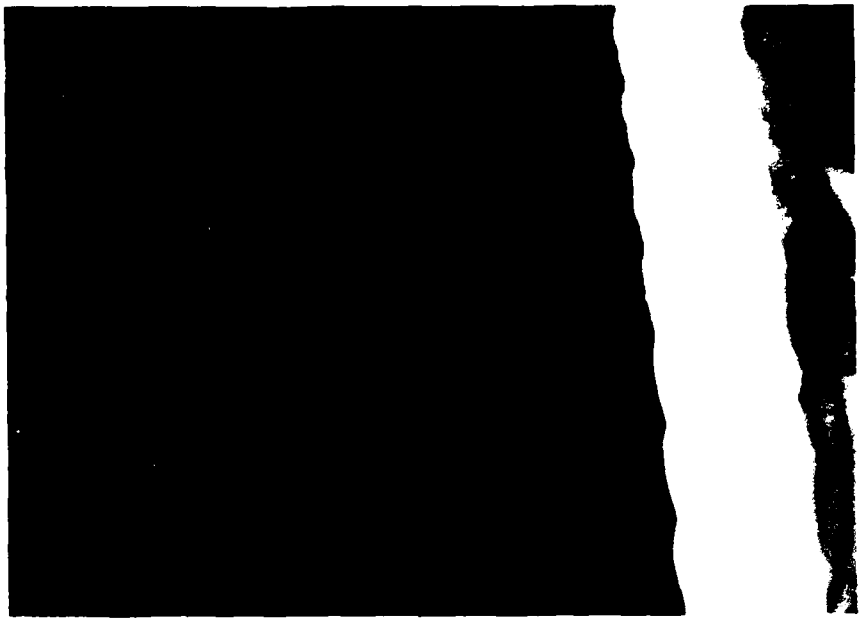


PHOTO 9: OUTLET FROM DROP INLET

PHOTO 10: DOWNSTREAM END OF PRINCIPAL SPILLWAY PIPE

PHOTO 11: PRINCIPAL SPILLWAY OUTLET AND DOWNSTREAM CHANNEL

PHOTO 12: OVERVIEW OF EMERGENCY SPILLWAY

PHOTO 13: EMERGENCY SPILLWAY CHANNEL LOOKING [illegible]

PHOTO 14: ANIMAL BURROW ON DOWNSTREAM FACE OF DAM

PHOTO 15: EROSION OF UPSTREAM FACE OF DAM

PHOTO 16: UPSTREAM WATERSHED AREA

PHOTO 17: ABANDONED PUMP HOUSE DOWNSTREAM OF DAM

PHOTO 18: AREA DOWNSTREAM OF DAM

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSES

HYDROLOGIC AND HYDRAULIC ANALYSES

To determine the overtopping potential, flood routings were performed by applying the Probable Maximum Precipitation (PMP) to a synthetic unit hydrograph to develop the inflow hydrograph. The inflow hydrograph was then routed through the reservoir and spillway. The overtopping analysis was determined using the computer program HEC-1 (Dam Safety Version) (1).

The PMP was determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33" (HMR-33) (2). Reduction factors were not applied. The rainfall distribution for the 24-hour PMP storm was determined according to the procedures outlined in HMR-33 and EM 1110-2-1411 (3). The Jefferson City, Missouri rainfall distribution (5 min. interval - 24 hours duration), as provided by the St. Louis District, Corps of Engineers, was used when the one percent and ten percent chance probability floods were routed through the reservoir and spillways.

The synthetic unit hydrograph for the watershed was developed by the computer program using the Soil Conservation Service (SCS) method (1,5). The parameters for the unit hydrograph are shown in Table 1. The formula from which the lag time was derived is noted in Table 1. The lag time was verified by the SCS curve number method (7).

The SCS curve number (CN) method was used in computing the infiltration losses for the rainfall-runoff relationship. The CN values used, and the result from the computer output, are shown in Table 2.

The reservoir routing was performed using the modified Puls Method. The initial reservoir pool elevation for the routing of each storm was assumed to be equivalent to the crest elevation of the principal spillway at elevation 684.0 feet m.s.l. in accordance with antecedent storm conditions AMC II, and AMC III preceding the one percent probability and probable maximum storms respectively, outlined by the U.S. Army Corps of Engineers, St. Louis District (4). The hydraulic capacity of the spillway and the storage capacity of the reservoir were defined by the elevation, surface area, storage, and discharge relationships shown in Table 3.

The rating curve for the spillway is shown in Table 4. The flow over the crest of the dam was determined using the non-level dam crest option ($L and $V cards) of the HEC-1 program. The program assumes critical flow over a broad-crested weir.

The result of the routing analysis indicates that a flood equivalent to a maximum of 10 percent of the PMF will not overtop the dam.

A summary of the routing analysis for different ratios of the PMF is shown in Table 5.

The computer input data and a summary of the output data are presented at the back of this appendix.

TABLE 1

SYNTHETIC UNIT HYDROGRAPH

Parameters:

Drainage Area (A)	64 acres
Length of Watercourse (L)	0.32 miles
Difference in Elevation (H)	91 feet
Time of concentration (T_c)	0.20 hours
Lag Time (L_g)	0.13 hours
Duration (D)	1.0 min. (use 5 min.)

Time (Min.) *	Discharge (cfs) *
0	0
5	126
10	282
15	205
20	88
25	40
30	18
35	8
40	4
45	2

* From HEC-1 computer output

FORMULAS USED:

$Tc = (11.9 \times L^3/H)^{0.385}$ (5)

$D = 0.133\ T_c$

$L_g = 0.6\ T_c$

TABLE 2

RAINFALL-RUNOFF VALUES

Selected Storm Event	Storm Duration (Hours)	Rainfall (Inches)	Runoff (Inches)	Loss (Inches)
PMP	24	32.37	31.35	1.02
1% Probability	24	7.44	5.33	2.11
10% Probability	24	5.21	3.27	1.94

Additional Data:

1) The soil associations in this watershed are Union, Mandeville, and Weldon (6).
   15 percent of drainage area is hydrologic soil Group B
   60 percent of drainage area is hydrologic soil Group C
   25 percent of drainage area is hydrologic soil Group D
   100 percent of the land use was residential
2) SCS Runoff Curve CN = 92 (AMC III) for the PMF.
3) SCS Runoff Curve CN = 82 (AMC II) for the one percent and ten percent probability floods (7).

TABLE 3

ELEVATION, SURFACE AREA, STORAGE, AND DISCHARGE RELATIONSHIPS

Elevation (feet-MSL)	Lake Surface Area (acres)	Lake Storage (acre-ft)	Spillway Discharge (cfs)
*684.0	6.3	50	0
**684.6	6.6	53	11
***685.5	6.8	60	50
685.9	6.9	63	70
686.2	7.0	65	86
686.5	7.2	67	110

*Principal Spillway Inlet Crest Elevation
**Emergency Spillway Crest Elevation
***Top of Dam Elevation

The relationships in Table 3 were developed from the Columbia, Missouri 7.5 minute quadrangle map and field measurements.

TABLE 4

SPILLWAY RATING CURVE

Reservoir Elevation (ft)	Principal Spillway Discharge (cfs)	Emergency Spillway Discharge (cfs)	Total Spillway Discharge (cfs)
*684.0	0	-	0
**684.6	11	0	11
685.0	21	5	26
***685.5	22	28	50
685.9	22	43	65
686.2	22	64	86
686.5	23	87	110

*Principal Spillway Inlet Crest Elevation
**Emergency Spillway Crest Elevation
***Top of Dam Elevation

METHOD USED:

Principal spillway release rates are based on the orifice equations of flow through a pipe culvert (8)

Emergency spillway release rates are based on the weir flow equation:

$Q = CL \times (H^{3/2})$
C = Coefficient of Discharge = 3.2 (9)
L = Length of Weir Crest = 9.4 (feet)
H = Head over Crest (feet)

TABLE 5

RESULTS OF FLOOD ROUTINGS

Ratio of PMF	Peak Inflow (cfs)	Peak Lake Elevation (ft.-msl)	Total Storage (ac.-ft.)	Peak Outflow (cfs)	Depth (ft.) Over Top of Dam	Duration of Over-topping (hrs)
-	0	*684.0	50	0	-	-
0.10	131	685.1	57	30	-	-
0.15	197	685.6	61	57	0.05	0.05
0.50	656	686.2	65	592	0.71	5.2
1.00	1,312	686.5	67	1,215	1.01	6.4

* Principal spillway inlet crest elevation

(1) U.S. Army Corps of Engineers, Hydrologic Engineering Center, Flood Hydrograph Package (HEC-1), Dam Safety Version, July 1978, Modification April 1980, Davis, California.

(2) HMR 33, Seasonal Variations of Probable Maximum Precipitation, East of the 105th Meridian for Areas 10 to 1000 Square Miles and Durations from 6 to 48 Hours, U.S. Department of Commerce, NOAA, National Weather Service, 1956.

(3) EM-1110-2-1411, Standard Project Flood Determinations, U.S. Army Corps of Engineers, 26 March 1952.

(4) U.S. Army Corps of Engineers, St. Louis District, Hydrologic/ Hydraulic Standards, Phase I Safety Inspection of Non-Federal Dams, 22 August 1980.

(5) U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, 1974, Washington, D.C.

(6) U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Boone County Missouri, 1962.

(7) U.S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, August 1972.

(8) Ernest F. Brater and Horace Williams King, Handbook of Hydraulics, New York: McGraw-Hill Book Co., Inc., 6th Edition, 1976, pp. 4-22-4-24.

(9) U.S. Department of the Interior, Geological Survey, Techniques of Water Resources Investigations of the United States Geological Survey, Chapter A5, 1967.

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P L A   C R   V E A T C H                                   PROGRAM  M21U2-1      PAGE    1
LISTING OF INPUT DATA                                       DATE  23 MAR 81   TIME  14:19:06

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     1           * M21  U2-1  9457
     2           A1       MISSOURI DAM INSPECTIONS
     3           A2       LAKE OZENA DAM
     4           A3       PMP AND RATIOS
     5           U    2HF                 5                                              1
     6           B1       5
     7           J        1         5         1
     8           P        J10.1    0.15      0.2      0.25      0.3      0.35      0.4      0.5      1.0
     9           K                 HEAD                                          1
    10           K1       COMPUTE INFLOW HYDROGRAPH
    11           K        1         2U.1                         1.0                                1
    12           P         24.9     121.     126.     130.
    13           T                                                          -1-02.
    14           K2       0.13
    15           A                  1.
    16           K        1      DAM                                    1
    17           K1       ROUTE HYDROGRAPH THROUGH DAM
    18           V                                      1         1
    19           V1       1                                  -684.          -1
    20           V4U*4.   6*4.5    655.     6*6.     6*7.     6EE.     689.     695.     692.
    21           V5U.     11.      24.      7*.      148.     278.     4*4.     825.     1059.
    22           1A..     6.3      6.1      11.7
    23           >S6*U.   6*4.     6*U.     7*U.
    24           1U6*4.
    25           1U6*5.5
    26           >L15U.   295.     389.     525.     650.     6*U.
    27           SV6*5.5  6*5.7    6*6.     6*6.2    6*6.3    6*U.
    28           K     99
    29           A
    30           A
    31           A
    32           A
    33           A

$ASG,A SYSLIB*ADD.
FAC WARNING        04020U104U00

$ASG,A SYSLIB*UU7.
FAC WARNING        04020U104U00

$ASG,A SYSLIB*M21.
FAC WARNING        04020U0U4000

$ASG,T 2.

$ASG,T 3.

$ASG,T 4.

$ASG,T 7.

$ASG,T 10.

$ASG,T 11.

$ASG,T 13.

$ASG,T 14.
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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

MISSOURI DAM INSPECTIONS
LAKE CYRENE DAM
PMF AND RATIOS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
289	0	5	0	0	0	0	0	3	0

JOPER	NRT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .10 .15 .20 .25 .30 .35 .40 .50 1.00

SUB-AREA RUNOFF COMPUTATION

COMPUTE INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
HEAD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.10	.00	.10	1.00	.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
.00	24.96	101.00	120.00	130.00	.00	.00	.00

LOSS DATA

LROPT	STRTR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSPX	RTIMP
0	.00	.00	1.00	.00	.00	1.00	-1.00	-92.00	.00	.00

CURVE NO = -92.00 WETNESS = -1.00 EFFECT CN = 92.00

UNIT HYDROGRAPH DATA
TC= .00 LAG= .13

RECESSION DATA
STRTQ= .00 QRCSN= .60 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(DLTKR IS GT LAG/2)

UNIT HYDROGRAPH 10 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .13 VOL= 1.00
126. 262. 2v5. 88. 40. 18. 8. 4. 2. 0.

0 END-OF-PERIOD FLOW

UNIT HYDROGRAPH 10 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .13 VOL= 1.00

926. 282. 245. 88. 40. 18. 8. 4. 2. 0.

FLOOD HYDROGRAPH PACKAGE - HEC-1 PROGRAM H21/02-1V TIME 14:19:17 CASE

	END-OF-PERIOD FLOW											
PO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	PO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.00	.01	0.	1.01	12.05	145	.21	.21	.00	68.
1.01	.10	2	.01	.00	.01	0.	1.01	12.10	146	.21	.21	.00	108.
1.01	.15	3	.01	.00	.01	0.	1.01	12.15	147	.21	.21	.00	137.
1.01	.20	4	.01	.00	.01	0.	1.01	12.20	148	.21	.21	.00	149.
1.01	.25	5	.01	.00	.01	0.	1.01	12.25	149	.21	.21	.00	155.
1.01	.30	6	.01	.00	.01	0.	1.01	12.30	150	.21	.21	.00	156.
1.01	.35	7	.01	.00	.01	0.	1.01	12.35	151	.21	.21	.00	159.
1.01	.40	8	.01	.00	.01	0.	1.01	12.40	152	.21	.21	.00	160.
1.01	.45	9	.01	.00	.01	0.	1.01	12.45	153	.21	.21	.00	160.
1.01	.50	10	.01	.00	.01	0.	1.01	12.50	154	.21	.21	.00	160.
1.01	.55	11	.01	.00	.01	0.	1.01	12.55	155	.21	.21	.00	160.
1.01	1.00	12	.01	.00	.01	0.	1.01	13.00	156	.21	.21	.00	160.
1.01	1.05	13	.01	.00	.01	0.	1.01	13.05	157	.25	.25	.00	166.
1.01	1.10	14	.01	.00	.01	0.	1.01	13.10	158	.25	.25	.00	178.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.15	159	.25	.25	.00	186.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.20	160	.25	.25	.00	190.
1.01	1.25	17	.01	.00	.01	1.	1.01	13.25	161	.25	.25	.00	192.
1.01	1.30	18	.01	.00	.01	1.	1.01	13.30	162	.25	.25	.00	193.
1.01	1.35	19	.01	.00	.01	1.	1.01	13.35	163	.25	.25	.00	193.
1.01	1.40	20	.01	.00	.01	2.	1.01	13.40	164	.25	.25	.00	193.
1.01	1.45	21	.01	.00	.01	2.	1.01	13.45	165	.25	.25	.00	193.
1.01	1.50	22	.01	.00	.01	2.	1.01	13.50	166	.25	.25	.00	193.
1.01	1.55	23	.01	.00	.01	2.	1.01	13.55	167	.25	.25	.00	193.
1.01	2.00	24	.01	.00	.01	3.	1.01	14.00	168	.25	.25	.00	194.
1.01	2.05	25	.01	.00	.01	3.	1.01	14.05	169	.31	.31	.00	201.
1.01	2.10	26	.01	.00	.01	3.	1.01	14.10	170	.31	.31	.00	219.
1.01	2.15	27	.01	.00	.01	3.	1.01	14.15	171	.31	.31	.00	232.
1.01	2.20	28	.01	.00	.01	3.	1.01	14.20	172	.31	.31	.00	236.
1.01	2.25	29	.01	.01	.01	4.	1.01	14.25	173	.31	.31	.00	240.
1.01	2.30	30	.01	.01	.01	4.	1.01	14.30	174	.31	.31	.00	241.
1.01	2.35	31	.01	.01	.01	4.	1.01	14.35	175	.31	.31	.00	242.
1.01	2.40	32	.01	.01	.01	4.	1.01	14.40	176	.31	.31	.00	242.
1.01	2.45	33	.01	.01	.01	4.	1.01	14.45	177	.31	.31	.00	242.
1.01	2.50	34	.01	.01	.01	4.	1.01	14.50	178	.31	.31	.00	242.
1.01	2.55	35	.01	.01	.01	5.	1.01	14.55	179	.31	.31	.00	242.
1.01	3.00	36	.01	.01	.01	5.	1.01	15.00	180	.31	.31	.00	243.
1.01	3.05	37	.01	.01	.01	5.	1.01	15.05	181	.19	.19	.00	227.
1.01	3.10	38	.01	.01	.01	5.	1.01	15.10	182	.38	.38	.00	216.
1.01	3.15	39	.01	.01	.01	5.	1.01	15.15	183	.38	.38	.00	245.
1.01	3.20	40	.01	.01	.01	5.	1.01	15.20	184	.57	.57	.00	298.
1.01	3.25	41	.01	.01	.01	5.	1.01	15.25	185	.67	.67	.00	375.
1.01	3.30	42	.01	.01	.01	5.	1.01	15.30	186	1.62	1.62	.00	567.
1.01	3.35	43	.01	.01	.01	6.	1.01	15.35	187	2.68	2.67	.00	1008.
1.01	3.40	44	.01	.01	.01	6.	1.01	15.40	188	1.05	1.05	.00	1312.
1.01	3.45	45	.01	.01	.01	6.	1.01	15.45	189	.67	.67	.00	1113.
1.01	3.50	46	.01	.01	.01	6.	1.01	15.50	190	.57	.57	.00	794.
1.01	3.55	47	.01	.01	.01	6.	1.01	15.55	191	.38	.38	.00	584.
1.01	4.00	48	.01	.01	.01	6.	1.01	16.00	192	.38	.38	.00	440.
1.01	4.05	49	.01	.01	.01	6.	1.01	16.05	193	.29	.29	.00	349.
1.01	4.10	50	.01	.01	.01	6.	1.01	16.10	194	.29	.29	.00	289.
1.01	4.15	51	.01	.01	.01	6.	1.01	16.15	195	.29	.29	.00	254.
1.01	4.20	52	.01	.01	.01	6.	1.01	16.20	196	.29	.29	.00	236.
1.01	4.25	53	.01	.01	.01	7.	1.01	16.25	197	.29	.29	.00	231.

1.01	4.50	54	.01	.01	.01	7.	1.01	16.50	198	.29	.29	.00	229.
1.01	4.55	55	.01	.01	.00	7.	1.01	16.55	199	.29	.29	.00	227.
1.01	4.60	56	.01	.01	.00	7.	1.01	16.60	200	.29	.29	.00	227.
1.01	4.65	57	.01	.01	.00	7.	1.01	16.65	201	.29	.29	.00	227.
1.01	4.70	58	.01	.01	.00	7.	1.01	16.70	202	.29	.29	.00	227.
1.01	4.75	59	.01	.01	.00	7.	1.01	16.75	203	.29	.29	.00	227.
1.01	5.00	60	.01	.01	.00	7.	1.01	17.00	204	.29	.29	.00	227.
1.01	5.05	61	.01	.01	.00	7.	1.01	17.05	205	.23	.23	.00	219.
1.01	5.10	62	.01	.01	.00	7.	1.01	17.10	206	.23	.23	.00	201.
1.01	5.15	63	.01	.01	.00	7.	1.01	17.15	207	.23	.23	.00	198.
1.01	5.20	64	.01	.01	.00	7.	1.01	17.20	208	.23	.23	.00	183.
1.01	5.25	65	.01	.01	.00	7.	1.01	17.25	209	.23	.23	.00	180.
1.01	5.30	66	.01	.01	.00	7.	1.01	17.30	210	.23	.23	.00	179.
1.01	5.35	67	.01	.01	.00	8.	1.01	17.35	211	.23	.23	.00	179.
1.01	5.40	68	.01	.01	.00	8.	1.01	17.40	212	.23	.23	.00	178.
1.01	5.45	69	.01	.01	.00	8.	1.01	17.45	213	.23	.23	.00	178.
1.01	5.50	70	.01	.01	.00	8.	1.01	17.50	214	.23	.23	.00	178.
1.01	5.55	71	.01	.01	.00	8.	1.01	17.55	215	.23	.23	.00	178.
1.01	6.00	72	.01	.01	.00	8.	1.01	18.00	216	.23	.23	.00	178.
1.01	6.05	73	.07	.05	.02	12.	1.01	18.05	217	.02	.02	.00	152.
1.01	6.10	74	.07	.05	.02	24.	1.01	18.10	218	.02	.02	.00	93.
1.01	6.15	75	.07	.05	.01	32.	1.01	18.15	219	.02	.02	.00	50.
1.01	6.20	76	.07	.05	.01	36.	1.01	18.20	220	.02	.02	.00	31.
1.01	6.25	77	.07	.05	.01	39.	1.01	18.25	221	.02	.02	.00	23.
1.01	6.30	78	.07	.05	.01	40.	1.01	18.30	222	.02	.02	.00	19.
1.01	6.35	79	.07	.05	.01	41.	1.01	18.35	223	.02	.02	.00	17.
1.01	6.40	80	.07	.06	.01	42.	1.01	18.40	224	.02	.02	.00	17.
1.01	6.45	81	.07	.06	.01	42.	1.01	18.45	225	.02	.02	.00	16.
1.01	6.50	82	.07	.06	.01	43.	1.01	18.50	226	.02	.02	.00	16.
1.01	6.55	83	.07	.06	.01	43.	1.01	18.55	227	.02	.02	.00	16.
1.01	7.00	84	.07	.06	.01	44.	1.01	19.00	228	.02	.02	.00	16.
1.01	7.05	85	.07	.06	.01	44.	1.01	19.05	229	.02	.02	.00	16.
1.01	7.10	86	.07	.06	.01	45.	1.01	19.10	230	.02	.02	.00	16.
1.01	7.15	87	.07	.06	.01	45.	1.01	19.15	231	.02	.02	.00	16.
1.01	7.20	88	.07	.06	.01	45.	1.01	19.20	232	.02	.02	.00	16.
1.01	7.25	89	.07	.06	.01	45.	1.01	19.25	233	.02	.02	.00	16.
1.01	7.30	90	.07	.06	.01	46.	1.01	19.30	234	.02	.02	.00	16.
1.01	7.35	91	.07	.06	.01	46.	1.01	19.35	235	.02	.02	.00	16.
1.01	7.40	92	.07	.06	.01	46.	1.01	19.40	236	.02	.02	.00	16.
1.01	7.45	93	.07	.06	.01	46.	1.01	19.45	237	.02	.02	.00	16.
1.01	7.50	94	.07	.06	.01	47.	1.01	19.50	238	.02	.02	.00	16.
1.01	7.55	95	.07	.06	.00	47.	1.01	19.55	239	.02	.02	.00	16.
1.01	8.00	96	.07	.06	.00	47.	1.01	20.00	240	.02	.02	.00	16.
1.01	8.05	97	.07	.06	.00	47.	1.01	20.05	241	.02	.02	.00	16.
1.01	8.10	98	.07	.06	.00	47.	1.01	20.10	242	.02	.02	.00	16.
1.01	8.15	99	.07	.06	.00	47.	1.01	20.15	243	.02	.02	.00	16.
1.01	8.20	100	.07	.06	.00	48.	1.01	20.20	244	.02	.02	.00	16.
1.01	8.25	101	.07	.06	.00	48.	1.01	20.25	245	.02	.02	.00	16.
1.01	8.30	102	.07	.06	.00	48.	1.01	20.30	246	.02	.02	.00	16.
1.01	8.35	103	.07	.06	.00	48.	1.01	20.35	247	.02	.02	.00	16.
1.01	8.40	104	.07	.06	.00	48.	1.01	20.40	248	.02	.02	.00	16.
1.01	8.45	105	.07	.06	.00	48.	1.01	20.45	249	.02	.02	.00	16.
1.01	8.50	106	.07	.06	.00	48.	1.01	20.50	250	.02	.02	.00	16.
1.01	8.55	107	.07	.06	.00	48.	1.01	20.55	251	.02	.02	.00	16.
1.01	9.00	108	.07	.06	.00	48.	1.01	21.00	252	.02	.02	.00	16.
1.01	9.05	109	.07	.06	.00	48.	1.01	21.05	253	.02	.02	.00	16.

1.01	9.10	110	.07	.06	.00	49.	1.01	21.10	254	.02	.02	.00	16.

1.01	8.50	106	.07	.06	.00	48.	1.01	20.50	250	.02	.02	.00	16.
1.	8.55	107	.07	.06	.00	48.	1.01	20.55	251	.02	.02	.00	16.
1.01	9.00	108	.07	.06	.00	48.	1.01	21.00	252	.02	.02	.00	16.
1.01	9.05	109	.07	.06	.00	48.	1.01	21.05	253	.02	.02	.00	16.
1.01	9.10	110	.07	.06	.00	49.	1.01	21.10	254	.02	.02	.00	16.
1.01	9.15	111	.07	.06	.00	49.	1.01	21.15	255	.02	.02	.00	16.
1.01	9.20	112	.07	.06	.00	49.	1.01	21.20	256	.02	.02	.00	16.
1.01	9.25	113	.07	.06	.00	49.	1.01	21.25	257	.02	.02	.00	16.
1.01	9.30	114	.07	.06	.00	49.	1.01	21.30	258	.02	.02	.00	16.
1.01	9.35	115	.07	.06	.00	49.	1.01	21.35	259	.02	.02	.00	16.
1.01	9.40	116	.07	.06	.00	49.	1.01	21.40	260	.02	.02	.00	16.
1.01	9.45	117	.07	.06	.00	49.	1.01	21.45	261	.02	.02	.00	16.
1.01	9.50	118	.07	.06	.00	49.	1.01	21.50	262	.02	.02	.00	16.
1.01	9.55	119	.07	.06	.00	49.	1.01	21.55	263	.02	.02	.00	16.
1.01	10.00	120	.07	.06	.00	49.	1.01	22.00	264	.02	.02	.00	16.
1.01	10.05	121	.07	.06	.00	49.	1.01	22.05	265	.02	.02	.00	16.
1.01	10.10	122	.07	.06	.00	49.	1.01	22.10	266	.02	.02	.00	16.
1.01	10.15	123	.07	.06	.00	49.	1.01	22.15	267	.02	.02	.00	16.
1.01	10.20	124	.07	.06	.00	49.	1.01	22.20	268	.02	.02	.00	16.
1.01	10.25	125	.07	.06	.00	49.	1.01	22.25	269	.02	.02	.00	16.
1.01	10.30	126	.07	.06	.00	49.	1.01	22.30	270	.02	.02	.00	16.
1.01	10.35	127	.07	.06	.00	49.	1.01	22.35	271	.02	.02	.00	16.
1.01	10.40	128	.07	.06	.00	49.	1.01	22.40	272	.02	.02	.00	16.
1.01	10.45	129	.07	.06	.00	49.	1.01	22.45	273	.02	.02	.00	16.
1.01	10.50	130	.07	.06	.00	50.	1.01	22.50	274	.02	.02	.00	16.
1.01	10.55	131	.07	.06	.00	50.	1.01	22.55	275	.02	.02	.00	16.
1.01	11.00	132	.07	.06	.00	50.	1.01	23.00	276	.02	.02	.00	16.
1.01	11.05	133	.07	.06	.00	50.	1.01	23.05	277	.02	.02	.00	16.
1.01	11.10	134	.07	.06	.00	50.	1.01	23.10	278	.02	.02	.00	16.
1.01	11.15	135	.07	.06	.00	50.	1.01	23.15	279	.02	.02	.00	16.
1.01	11.20	136	.07	.06	.00	50.	1.01	23.20	280	.02	.02	.00	16.
1.01	11.25	137	.07	.06	.00	50.	1.01	23.25	281	.02	.02	.00	16.
1.01	11.30	138	.07	.06	.00	50.	1.01	23.30	282	.02	.02	.00	16.
1.01	11.35	139	.07	.06	.00	50.	1.01	23.35	283	.02	.02	.00	16.
1.01	11.40	140	.07	.06	.00	50.	1.01	23.40	284	.02	.02	.00	16.
1.01	11.45	141	.07	.06	.00	50.	1.01	23.45	285	.02	.02	.00	16.
1.01	11.50	142	.07	.06	.00	50.	1.01	23.50	286	.02	.02	.00	16.
1.01	11.55	143	.07	.06	.00	50.	1.01	23.55	287	.02	.02	.00	16.
1.01	12.00	144	.07	.06	.00	50.	1.02	.00	288	.02	.02	.00	16.
									SUM	32.37	31.75	1.02	24233.
										(822.)(	806.)(	26.)(	686.20)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1312.	267.	84.	84.	24229.
CMS	37.	8.	2.	2.	686.
INCHES		24.98	31.30	31.30	31.30
MM		634.83	795.13	795.13	795.13
AC-FT		133.	167.	167.	167.
THOUS CU M		164.	206.	206.	206.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	111.	27.	8.	8.	2423.
CMS	4.	1.	0.	0.	69.
INCHES		2.49	3.13	3.13	3.13
MM		63.18	79.51	79.51	79.51

AC-FT		15.	17.	17.	17.
THOUS CU M		18.	21.	21.	21.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	197.	43.	13.	13.	3434.
CMS	6.	1.	0.	0.	10?.
INCHES		3.??	4.70	4.70	4.?0
MM		94.??	119.??	119.??	119.??
AC-FT		20.	25.	25.	25.
THOUS CU M		25.	?1.	?1.	31.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	262.	53.	17.	17.	4?4?.
CMS	7.	2.	0.	0.	137.
INCHES		4.98	6.?6	6.26	6.26
MM		126.37	159.??	159.??	159.?3
AC-FT		27.	33.	33.	33.
THOUS CU M		33.	41.	41.	41.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 4

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	326.	??.	21.	21.	6?57.
CMS	9.	2.	1.	1.	172.
INCHES		6.?2	7.83	7.83	7.83
MM		157.?6	198.??	198.??	198.?8
AC-FT		33.	42.	42.	42.
THOUS CU M		41.	51.	51.	51.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	394.	??.	25.	25.	?269.
CMS	11.	2.	1.	1.	206.
INCHES		?.??	9.39	9.39	9.?9
MM		189.55	238.54	238.54	238.54
AC-FT		??.	?0.	50.	50.
THOUS CU M		49.	62.	62.	62.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 6

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

CFS	459.	94.	29.	29.	8480.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 6

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	453.	54.	29.	29.	8485.
CMS	13.	2.	1.	1.	240.
INCHES		8.71	10.96	10.96	10.96
MM		221.14	278.29	278.29	278.29
AC-FT		46.	58.	58.	58.
THOUS CU M		57.	72.	72.	72.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 7

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	525.	107.	54.	54.	9492.
CMS	15.	3.	1.	1.	274.
INCHES		9.95	12.52	12.52	12.52
MM		252.79	318.05	318.05	318.05
AC-FT		53.	67.	67.	67.
THOUS CU M		65.	82.	82.	82.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 8

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	696.	176.	62.	62.	12115.
CMS	19.	4.	1.	1.	343.
INCHES		12.44	15.65	15.65	15.65
MM		315.91	397.56	397.56	397.56
AC-FT		86.	83.	83.	83.
THOUS CU M		82.	103.	103.	103.

HYDROGRAPH AT STA HEAD FOR PLAN 1, RTIO 9

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1312.	287.	84.	94.	24229.
CMS	37.	8.	2.	2.	686.
INCHES		24.38	31.30	31.30	31.30
MM		691.23	795.13	795.13	795.13
AC-FT		153.	167.	167.	167.
THOUS CU M		164.	206.	206.	206.

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH BAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BAM	1	0	6	0	0	1	0	0

ROUTING DATA

		LOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPRP	ESTR
		.0	.000	.00	1	1	0	0	0
			NSTPS	NSTPL	LAG	AMSKK	X	TSK	STORA	ISPRAT
			1	0	0	.000	.000	.000	-684.	-1

STAGE	684.00	684.50	685.00	686.00	687.00	688.00	689.00	690.00	692.00
FLOW	.00	11.00	26.00	72.00	148.00	278.00	434.00	825.00	1650.00
SURFACE AREA=	3.	6.	9.	12.					
CAPACITY=	0.	50.	93.	192.					
ELEVATION=	680.	684.	690.	700.					

CWEL	SPWID	COOR	EXPW	ELEVL	COOL	CAREA	EXPL
694.3	.0	.0	.0	.0	.0	.0	.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
695.5	.0	.0	0.

CREST LENGTH AT OR BELOW ELEVATION	150. 695.5	215. 695.7	380. 696.0	525. 696.2	650. 696.3	650. 696.3

STATION DAM, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	5.	5.	5.
5.	6.	6.	6.	6.	6.	7.	7.	7.	7.
8.	8.	8.	9.	9.	9.	9.	9.	10.	10.
10.	11.	11.	11.	12.	12.	12.	13.	13.	14.
14.	14.	14.	15.	15.	14.	18.	21.	24.	27.
29.	30.	33.	30.	30.	30.	30.	29.	29.	29.
29.	28.	28.	28.	27.	27.	27.	26.	26.	26.
24.	25.	25.	25.	25.	24.	24.	24.	23.	23.
22.	22.	21.	20.	20.	19.	19.	18.	18.	17.
17.	16.	16.	15.	15.	14.	14.	14.	13.	13.

13.	12.	12.	12.	11.	11.	11.	11.	10.	10.

```
     29.     28.     28.     28.     27.     27.     27.     26.     26.     26.
     24.     25.     25.     25.     25.     24.     24.     24.     23.     23.
     22.     22.     21.     20.     20.     19.     19.     18.     18.     17.
     17.     16.     16.     15.     15.     14.     14.     14.     13.     13.

B L A C K   &   V E A T C H                                                PROJECT 9457:      DATE 23 MAR 81   PAGE   10
************************************************************************************************************************
FLOOD HYDROGRAPH PACKAGE - HEC-1                                           PROGRAM H21/C2-1V   TIME  14:19:17   CASE

     12.     12.     12.     12.     11.     11.     11.     11.     10.     10.
     10.     10.     10.      9.      9.      9.      9.      9.      9.      8.
      8.      8.      8.      8.      8.      7.      7.      7.      7.      7.
      7.      7.      7.      6.      6.      6.      6.      6.      6.      6.
      6.      6.      6.      5.      5.      5.      5.      5.

                                    STORAGE
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     50.     50.     50.     50.     50.     50.     50.     50.     50.
     50.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     51.     51.     51.
     51.     51.     51.     51.     51.     51.     51.     52.     52.     52.
     52.     52.     52.     52.     52.     52.     52.     52.     52.     52.
     52.     52.     52.     52.     52.     52.     52.     52.     52.     53.
     53.     53.     53.     53.     53.     53.     53.     53.     53.     53.
     53.     53.     54.     54.     54.     54.     54.     54.     54.     54.
     54.     54.     54.     54.     55.     55.     55.     56.     56.     57.
     57.     57.     57.     57.     57.     57.     57.     57.     57.     57.
     57.     57.     57.     57.     57.     57.     57.     57.     57.     57.
     57.     57.     57.     57.     57.     57.     56.     56.     56.     56.
     56.     56.     56.     56.     55.     55.     55.     55.     55.     55.
     55.     55.     55.     55.     54.     54.     54.     54.     54.     54.
     54.     54.     54.     54.     54.     54.     54.     53.     53.     53.
     53.     53.     53.     53.     53.     53.     53.     53.     52.     53.
     53.     53.     53.     53.     53.     53.     53.     52.     52.     52.
     52.     52.     52.     52.     52.     52.     52.     52.     52.     52.
     52.     52.     52.     52.     52.     52.     52.     52.

                                     STAGE
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0   684.0
   684.0   684.0   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1
   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1
   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1
   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1   684.1
   684.1   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2
   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2
   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2   684.2
   684.2   684.3   684.3   684.3   684.3   684.3   684.3   684.3   684.3   684.3
   684.4   684.4   684.4   684.4   684.4   684.4   684.4   684.4   684.4   684.5
   684.5   684.5   684.5   684.5   684.5   684.5   684.5   684.6   684.6   684.6
```

6P4.6	6P4.6	6P4.6	6P4.6	6P4.6	6P4.7	6P4.7	6P4.8	6P4.9	6P5.0
6P5.1	6P5.1	6P5.1	6P5.1	6P5.1	6P5.1	6P5.1	6P5.1	6P5.1	6P5.1
6P5.1	6P5.0	6P5.0	6P5.0	6P5.0	6P5.0	6P5.0	6P5.0	6P5.0	6P5.0
6P5.0	6P5.0	6P5.0	6P5.0	6P5.0	6P4.9	6P4.9	6P4.9	6P4.9	6P4.9
6P4.9	6P4.9	6P4.8	6P4.8	6P4.8	6P4.8	6P4.8	6P4.7	6P4.7	6P4.7
6P4.7	6P4.7	6P4.7	6P4.6	6P4.6	6P4.6	6P4.6	6P4.6	6P4.6	6P4.6
6P4.6	6P4.5	6P4.5	6P4.5	6P4.5	6P4.5	6P4.5	6P4.5	6P4.5	6P4.5
6P4.5	6P4.4	6P4.4	6P4.4	6P4.4	6P4.4	6P4.4	6P4.4	6P4.4	6P4.4
6P4.4	6P4.4	6P4.4	6P4.4	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3
6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3	6P4.3
6P4.3	6P4.3	6P4.3	6P4.2	6P4.2	6P4.2	6P4.2	6P4.2		

PEAK OUTFLOW IS 30. AT TIME 16.17 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30.	21.	8.	8.	2212.
CMS	1.	1.	0.	0.	63.
INCHES		1.91	2.66	2.66	2.66
MM		48.63	72.60	72.60	72.60
AC-FT		14.	15.	15.	15.
THOUS CU M		13.	19.	19.	18.

STATION DAM, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	2.	2.	2.	2.	2.	2.	2.	2.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	7.	7.	8.
8.	9.	9.	9.	9.	10.	10.	10.	11.	11.
12.	12.	13.	13.	14.	14.	15.	15.	16.	16.
17.	17.	18.	19.	19.	19.	20.	21.	21.	21.
22.	22.	23.	23.	24.	25.	30.	36.	43.	48.
52.	56.	57.	55.	53.	50.	49.	48.	48.	47.
46.	46.	45.	45.	44.	44.	43.	42.	42.	41.
40.	40.	39.	39.	38.	38.	37.	36.	35.	34.
32.	31.	30.	29.	27.	26.	25.	25.	24.	23.
23.	22.	21.	21.	20.	20.	19.	19.	18.	18.
17.	17.	16.	16.	15.	15.	15.	14.	14.	14.
13.	13.	13.	12.	12.	12.	11.	11.	11.	11.

10.	10.	10.	10.	10.	10.	9.	9.	9.	9.

PEAK OUTFLOW IS 462. AT TIME 15.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	462.	98.	36.	32.	9249.
CMS	13.	3.	1.	1.	262.
INCHES		0.18	11.96	11.95	11.95
MM		272.68	303.52	303.53	303.53
AC-FT		49.	64.	64.	64.
THOUS CU M		60.	79.	79.	79.

STATION DAM, PLAN 1, RATIO 8

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	3.	3.	3.	4.	4.	5.
5.	5.	6.	6.	6.	7.	7.	7.	8.	8.
9.	9.	9.	10.	10.	10.	10.	11.	11.	11.
12.	12.	13.	13.	13.	14.	14.	14.	15.	15.
15.	15.	16.	16.	16.	16.	17.	17.	17.	17.
18.	18.	18.	18.	18.	19.	19.	19.	19.	19.
20.	20.	20.	20.	20.	20.	20.	21.	21.	21.
21.	21.	21.	21.	22.	22.	23.	25.	27.	29.
32.	36.	38.	39.	40.	42.	44.	46.	48.	51.
59.	67.	75.	81.	86.	89.	92.	94.	96.	98.
107.	109.	112.	115.	117.	119.	120.	120.	120.	121.
119.	118.	118.	124.	149.	167.	209.	314.	502.	494.
377.	293.	235.	199.	166.	145.	133.	125.	129.	118.
114.	119.	119.	114.	113.	110.	104.	101.	98.	95.
93.	92.	91.	91.	90.	90.	89.	79.	67.	57.
50.	49.	46.	44.	42.	41.	39.	38.	37.	35.
34.	33.	32.	30.	29.	28.	28.	27.	26.	25.
25.	24.	24.	23.	23.	22.	22.	22.	21.	21.
21.	20.	20.	19.	19.	19.	19.	18.	18.	17.
17.	17.	16.	16.	16.	16.	15.	15.	15.	15.
15.	14.	14.	14.	14.	14.	13.	13.	13.	13.
13.	13.	13.	13.	12.	12.	12.	12.		

STORAGE

50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.

51.	51.	51.	51.	51.	51.	51.	51.	52.	52.

STAGE

PEAK OUTFLOW IS [illegible] AT TIME 15.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	592.	170.	46.	46.	11622.
CMS	17.	4.	1.	1.	329.
INCHES		11.72	15.01	15.01	15.01
MM		297.74	381.38	381.38	381.38
AC-FT		66.	90.	90.	90.
TOOLS CL *		77.	99.	99.	99.

STATION DAM, PLAN 1, RATIO 0

END-OF-PERIOD HYDROGRAPH ORDINATES

CUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	5.	5.	6.	7.	7.	8.	9.
10.	11.	11.	12.	13.	14.	15.	16.	17.	18.
19.	20.	20.	21.	22.	23.	24.	24.	25.	26.
26.	27.	27.	28.	30.	31.	32.	33.	33.	34.
35.	35.	36.	37.	37.	38.	38.	39.	39.	40.
40.	40.	41.	41.	42.	42.	42.	43.	43.	43.
44.	44.	44.	44.	45.	45.	45.	45.	45.	45.
46.	46.	46.	46.	47.	48.	60.	82.	105.	125.
139.	148.	153.	156.	158.	159.	161.	166.	174.	181.
184.	186.	191.	192.	192.	193.	193.	193.	195.	203.
215.	226.	235.	237.	240.	241.	242.	242.	242.	242.
239.	229.	230.	254.	306.	425.	740.	1172.	1215.	938.
692.	532.	429.	345.	298.	264.	246.	237.	232.	229.
226.	224.	227.	227.	225.	217.	205.	194.	188.	184.
181.	180.	179.	178.	178.	178.	178.	172.	148.	116.
89.	69.	56.	48.	47.	46.	44.	43.	42.	40.
39.	38.	37.	36.	35.	34.	34.	33.	32.	31.
31.	30.	29.	28.	28.	28.	27.	26.	26.	26.
25.	25.	25.	25.	24.	24.	24.	24.	23.	23.
23.	23.	23.	22.	22.	22.	22.	22.	21.	21.
21.	21.	21.	21.	20.	20.	20.	20.	20.	20.
20.	20.	20.	19.	19.	19.	19.	19.		

STORAGE

50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
50.	50.	50.	50.	50.	50.	50.	50.	50.	50.
50.	50.	50.	50.	50.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	51.	51.	51.	51.	51.
51.	51.	51.	51.	51.	52.	52.	52.	52.	52.
52.	52.	52.	52.	52.	52.	52.	53.	53.	53.
53.	53.	54.	54.	54.	54.	55.	55.	55.	

56.	55.	57.	56.	56.	56.	56.	56.	57.	57.

STAGE

PEAK OUTFLOW IS 1215. AT TIME 15.75 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME

CFS	1215.	475.	92.	92.	23459.
CMS	34.	8.	2.	2.	664.
INCHES		24.64	30.36	30.36	30.36
AC-FT		1771.	162.	162.	162.
INCHES CU M		162.	200.	200.	200.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .10	RATIO 2 .15	RATIO 3 .20	RATIO 4 .25	RATIO 5 .30	RATIO 6 .35	RATIO 7 .40	RATIO 8 .50	RATIO 9 1.00
HYDROGRAPH AT	HEAD	.13	1	131.	197.	262.	328.	394.	459.	525.	656.	1312.
	(	.20)	(	3.72)(	5.57)(	7.43)(	9.29)(	11.15)(	13.00)(	14.86)(	18.58)(	37.16)
ROUTED TO	DAM	.13	1	35.	57.	147.	239.	325.	395.	462.	592.	1215.
	(	.20)	(	.86)(	1.61)(	4.17)(	6.76)(	9.21)(	11.19)(	13.08)(	16.78)(	34.41)

SUMMARY OF DAM SAFETY ANALYSIS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	6[illegible]4.00	684.00	6[illegible]5.50
STORAGE	50.	59.	93.
OUTFLOW	0.	0.	49.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	6[illegible]5.10	.60	57.	30.	.00	16.17	.00
.15	6[illegible]5.55	.65	61.	57.	.50	16.08	.00
.20	6[illegible]5.78	.88	64.	147.	1.58	15.83	.00
.25	6[illegible]5.91	.41	63.	239.	2.42	15.75	.00
.30	6[illegible]6.01	.51	64.	325.	3.33	15.75	.00
.35	6[illegible]6.07	.57	64.	395.	3.92	15.75	.00
.40	6[illegible]6.12	.62	64.	462.	4.50	15.75	.00
.50	686.21	.71	65.	592.	5.17	15.75	.00
1.00	686.51	1.01	67.	1215.	6.42	15.75	.00

END

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B L A C K   R   V E A T C H                                   PROGRAM  H21/G2-1      PAGE    1
LISTING OF INPUT DATA                                        DATE  25 MAR 81   TIME  13:17:58

                .....1.....2.....3.....4.....5.....6.....7.....8
SEQ #  CTS #  12345678901234567890123456789012345678901234567890123456789012345678901234567890

    1          * H21  G2-1  9457
    2          A1       MISSOURI DAM INSPECTIONS
    3          A2       LAKE EYRENE DAM
    4          A3       1% YEAR
    5          B   240          5                                        3
    6          B1
    7          R              HEAD                          1
    8          R1       COMPUTE INFLOW HYDROGRAPH
    9          R             2.0      2.0+1                    1.0
   10          O   240    7.444                  DA #      .55
   11          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   12          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   13          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   14          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   15          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   16          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   17          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   18          O1  .007    .007     .013     .013     .013     .013     .013     .013     .013     .013
   19          O1  .013    .013     .013     .013     .013     .013     .013     .013     .013     .013
   20          O1  .013    .013     .013     .013     .013     .013     .013     .013     .013     .013
   21          O1  .013    .013     .013     .013     .013     .013     .013     .013     .026     .026
   22          O1  .026    .026     .026     .026     .026     .026     .026     .026     .026     .026
   23          O1  .026    .026     .026     .026     .026     .026     .029     .029     .029     .029
   24          O1  .029    .029     .029     .061     .061     .061     .061     .061     .121     .124
   25          O1  .124    .236     .236     .551     .838     .943     .236     .124     .124     .123
   26          O1  .061    .061     .061     .061     .061     .061     .029     .029     .029     .029
   27          O1  .029    .029     .026     .026     .026     .026     .026     .026     .026     .026
   28          O1  .026    .026     .026     .026     .026     .026     .026     .026     .026     .026
   29          O1  .013    .013     .013     .013     .013     .013     .013     .013     .013     .013
   30          O1  .013    .013     .013     .013     .013     .013     .013     .013     .013     .013
   31          O1  .013    .013     .013     .013     .013     .013     .013     .013     .013     .013
   32          O1  .013    .013     .013     .013     .013     .013     .007     .007     .007     .007
   33          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   34          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   35          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   36          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   37          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   38          O1  .007    .007     .007     .007     .007     .007     .007     .007     .007     .007
   39          O1  .007    .007     .007     .007     .007     .007     .007     .007
   40          T                                                        -1-P2.
   41          R2       ***2
   42          R                1.
   43          R       1     DAM                              1
   44          R1       ROUTE HYDROGRAPH THROUGH DAM
   45          T                                  1       1
   46          T*       1                                        -EP4.          -1
   47          T4834.  9E+03   5P5.     6P0.     687.     8P8.     689.     690.     692.
   48          T50.     11.     25.      72.      148.     278.     424.     825.     1050.
   49          T8U.     8.3     8.1      11.7
   50          T***.    ***.    8**.     7**.
```

LISTING OF INPUT DATA DATE 25 MAR 81 TIME 13:17:28

```
                1         2         3         4         5         6         7         8
SEQ #  CTS 0 1234567890123456789012345678901234567890123456789012345678901234567890
   51         $96^6.
   52         $06^5.5
   53         $L15..  215.    395.    525.    650.    650.
   54         $V5^5.5 5^5.7   596.    686.2   6^6.5   690.
   55         *     99
   56         A
   57         A
   58         A
   59         A
   60         A

BASG,A SYSLI**H3D.
FAC WARNING       9402^,136,3U

BASG,A SYSLI**U37.
FAC WARNING       9402^,3U4,^9

BASG,A SYSLI**H21.
FAC WARNING       9402^^3U4,^U

BASG,T 2.

BASG,T 3.

BASG,T 4.

BASG,T 7.

BASG,T 1^.

BASG,T 11.

BASG,T 13.

BASG,T 14.

BASG,T 15.

SAQT SYSLI**U,^,L,7

SAQT,V $YSLI**H21.H21/02-1
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**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
**********************************
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MISSOURI DAM INSPECTIONS
LAKE CYRENE DAM
100 YEAR

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	5	0	0	0	0	0	1	0

JOPER	NWT	LROPT	TRACE
3	0	0	0

**********   **********   **********   **********   **********

SUB-AREA RUNOFF COMPUTATION

COMPUTE INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
HEAD	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.10	.00	.10	1.00	.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
288	7.44	.00	.00

PRECIP PATTERN

.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
[illegible]	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
.03	.03	.03	.03	.03	.03	.02	.03	.03	.03
[illegible]	[illegible]	[illegible]	.06	[illegible]	.08	.08	.05	.12	.12
[illegible]	[illegible]	.24	.55	.24	[illegible]	.24	.12	.12	.12
[illegible]	[illegible]	[illegible]	.08	.08	.09	.03	.03	.03	.03
[illegible]	[illegible]	.03	.03	.03	.03	.03	.03	.03	.03
[illegible]	[illegible]	[illegible]	.03	.03	.03	.03	.03	.03	.03
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01

.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01
.01 .01 .01 .01 .01 .01 .01 .01 .01 .01

LOSS DATA

LOSS	STRTR	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMA	RTIMP
0	.00	.00	1.00	.00	.00	1.00	-1.00	-82.00	.00	.00

CURVE NO = -32.00 WETNESS = -1.00 EFFECT CN = 82.00

UNIT HYDROGRAPH DATA
TC= .00 LAG= .20

RECESSION DATA
STRTQ= .0 QRCSN= .00 RTIOR= 1.00

UNIT HYDROGRAPH 14 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .20 VOL= 1.00
46. 147. 249. 159. 85. 51. 29. 17. 9. 5.
3. 2. 1. 0.

END-OF-PERIOD FLOW

RO.DR	HE.PR	PERIOD	RAIN	EXCS	LOSS	COMP Q	RO.DR	HE.PR	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	.00	.01	0.	1.01	12.05	145	.04	.01	.03	188.
1.01	.10	2	.01	.00	.01	0.	1.01	12.10	146	.08	.04	.05	274.
1.01	.15	3	.01	.00	.01	0.	1.01	12.15	147	.24	.21	.03	308.
1.01	.20	4	.01	.00	.01	0.	1.01	12.20	148	.12	.11	.01	277.
1.01	.25	5	.01	.00	.01	0.	1.01	12.25	149	.12	.11	.01	215.
1.01	.30	6	.01	.00	.01	0.	1.01	12.30	150	.12	.11	.01	164.
1.01	.35	7	.01	.00	.01	0.	1.01	12.35	151	.08	.07	.01	129.
1.01	.40	8	.01	.00	.01	0.	1.01	12.40	152	.08	.07	.01	104.
1.01	.45	9	.01	.00	.01	0.	1.01	12.45	153	.08	.07	.01	85.
1.01	.50	10	.01	.00	.01	0.	1.01	12.50	154	.08	.07	.01	73.
1.01	.55	11	.01	.00	.01	0.	1.01	12.55	155	.08	.07	.01	66.
1.01	1.00	12	.01	.00	.01	0.	1.01	13.00	156	.08	.07	.01	62.
1.01	1.05	13	.01	.00	.01	0.	1.01	13.05	157	.08	.05	.03	58.
1.01	1.10	14	.01	.00	.01	0.	1.01	13.10	158	.08	.05	.03	49.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.15	159	.08	.04	.03	39.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.20	160	.08	.04	.03	31.
1.01	1.25	17	.01	.00	.01	0.	1.01	13.25	161	.08	.04	.03	26.
1.01	1.30	18	.01	.00	.01	0.	1.01	13.30	162	.08	.03	.03	24.
1.01	1.35	19	.01	.00	.01	0.	1.01	13.35	163	.08	.02	.06	22.
1.01	1.40	20	.01	.00	.01	0.	1.01	13.40	164	.08	.02	.06	21.
1.01	1.45	21	.01	.00	.01	0.	1.01	13.45	165	.08	.02	.06	20.
1.01	1.50	22	.01	.00	.01	0.	1.01	13.50	166	.08	.02	.06	19.
1.01	1.55	23	.01	.00	.01	0.	1.01	13.55	167	.08	.02	.06	19.
1.01	2.00	24	.01	.00	.01	0.	1.01	14.00	168	.08	.02	.06	19.
1.01	2.05	25	.01	.00	.01	0.	1.01	14.05	169	.08	.02	.06	19.
1.01	2.10	26	.01	.00	.01	0.	1.01	14.10	170	.08	.02	.06	19.
1.01	2.15	27	.01	.00	.01	0.	1.01	14.15	171	.08	.02	.06	19.
1.01	2.20	28	.01	.00	.01	0.	1.01	14.20	172	.08	.02	.06	19.
1.01	2.25	29	.01	.00	.01	0.	1.01	14.25	173	.08	.02	.06	19.

1.01	2.30	30	.01	.00	.01	0.	1.01	14.30	174	.08	.02	.06	19.

1.00	2.10	26	.00	.00	.00	0.	1.00	14.10	173	.00	.02	.00	19.	
1.00	2.15	27	.00	.00	.00	0.	1.00	14.15	174	.00	.02	.00	19.	
1.00	2.20	28	.00	.00	.00	0.	1.00	14.20	175	.00	.02	.00	19.	
1.00	2.25	29	.00	.00	.00	0.	1.00	14.25	176	.00	.02	.00	19.	

1.00	2.30	30	.00	.00	.00	0.	1.00	14.30	174	.00	.02	.00	19.	
1.00	2.35	31	.00	.00	.00	0.	1.00	14.35	175	.00	.02	.00	19.	
1.00	2.40	32	.00	.00	.00	0.	1.00	14.40	176	.00	.02	.00	19.	
1.00	2.45	33	.00	.00	.00	0.	1.00	14.45	177	.00	.02	.00	19.	
1.00	2.50	34	.00	.00	.00	0.	1.00	14.50	178	.00	.02	.00	19.	
1.00	2.55	35	.00	.00	.00	0.	1.00	14.55	179	.00	.02	.00	19.	
1.00	3.00	36	.00	.00	.00	0.	1.00	15.00	180	.00	.02	.00	19.	
1.00	3.05	37	.00	.00	.00	0.	1.00	15.05	181	.00	.01	.00	18.	
1.00	3.10	38	.00	.00	.00	0.	1.00	15.10	182	.00	.01	.00	16.	
1.00	3.15	39	.00	.00	.00	0.	1.00	15.15	183	.00	.01	.00	14.	
1.00	3.20	40	.00	.00	.00	0.	1.00	15.20	184	.00	.01	.00	12.	
1.00	3.25	41	.00	.00	.00	0.	1.00	15.25	185	.00	.01	.00	11.	
1.00	3.30	42	.00	.00	.00	0.	1.00	15.30	186	.00	.01	.00	10.	
1.00	3.35	43	.00	.00	.00	0.	1.00	15.35	187	.00	.01	.00	10.	
1.00	3.40	44	.00	.00	.00	0.	1.00	15.40	188	.00	.01	.00	10.	
1.00	3.45	45	.00	.00	.00	0.	1.00	15.45	189	.00	.01	.00	10.	
1.00	3.50	46	.00	.00	.00	0.	1.00	15.50	190	.00	.01	.00	9.	
1.00	3.55	47	.00	.00	.00	0.	1.00	15.55	191	.00	.01	.00	9.	
1.00	4.00	48	.00	.00	.00	0.	1.00	16.00	192	.00	.01	.00	9.	
1.00	4.05	49	.00	.00	.00	0.	1.00	16.05	193	.00	.01	.00	9.	
1.00	4.10	50	.00	.00	.00	0.	1.00	16.10	194	.00	.01	.00	9.	
1.00	4.15	51	.00	.00	.00	0.	1.00	16.15	195	.00	.01	.00	9.	
1.00	4.20	52	.00	.00	.00	0.	1.00	16.20	196	.00	.01	.00	9.	
1.00	4.25	53	.00	.00	.00	0.	1.00	16.25	197	.00	.01	.00	9.	
1.00	4.30	54	.00	.00	.00	0.	1.00	16.30	198	.00	.01	.00	9.	
1.00	4.35	55	.00	.00	.00	0.	1.00	16.35	199	.00	.01	.00	9.	
1.00	4.40	56	.00	.00	.00	0.	1.00	16.40	200	.00	.01	.00	9.	
1.00	4.45	57	.00	.00	.00	0.	1.00	16.45	201	.00	.01	.00	9.	
1.00	4.50	58	.00	.00	.00	0.	1.00	16.50	202	.00	.01	.00	9.	
1.00	4.55	59	.00	.00	.00	0.	1.00	16.55	203	.00	.01	.00	9.	
1.00	5.00	60	.00	.00	.00	0.	1.00	17.00	204	.00	.01	.00	9.	
1.00	5.05	61	.00	.00	.00	0.	1.00	17.05	205	.00	.01	.00	9.	
1.00	5.10	62	.00	.00	.00	0.	1.00	17.10	206	.00	.01	.00	9.	
1.00	5.15	63	.00	.00	.00	0.	1.00	17.15	207	.00	.01	.00	9.	
1.00	5.20	64	.00	.00	.00	0.	1.00	17.20	208	.00	.01	.00	9.	
1.00	5.25	65	.00	.00	.00	0.	1.00	17.25	209	.00	.01	.00	9.	
1.00	5.30	66	.00	.00	.00	0.	1.00	17.30	210	.00	.01	.00	9.	
1.00	5.35	67	.00	.00	.00	0.	1.00	17.35	211	.00	.01	.00	9.	
1.00	5.40	68	.00	.00	.00	0.	1.00	17.40	212	.00	.01	.00	9.	
1.00	5.45	69	.00	.00	.00	0.	1.00	17.45	213	.00	.01	.00	9.	
1.00	5.50	70	.00	.00	.00	0.	1.00	17.50	214	.00	.01	.00	9.	
1.00	5.55	71	.00	.00	.00	0.	1.00	17.55	215	.00	.01	.00	9.	
1.00	6.00	72	.00	.00	.00	0.	1.00	18.00	216	.00	.01	.00	9.	
1.00	6.05	73	.00	.00	.00	0.	1.00	18.05	217	.00	.01	.00	9.	
1.00	6.10	74	.00	.00	.00	0.	1.00	18.10	218	.00	.01	.00	8.	
1.00	6.15	75	.00	.00	.00	0.	1.00	18.15	219	.00	.01	.00	7.	
1.00	6.20	76	.00	.00	.00	0.	1.00	18.20	220	.00	.01	.00	6.	
1.00	6.25	77	.00	.00	.00	0.	1.00	18.25	221	.00	.01	.00	6.	
1.00	6.30	78	.00	.00	.00	0.	1.00	18.30	222	.00	.01	.00	5.	
1.00	6.35	79	.00	.00	.00	0.	1.00	18.35	223	.00	.01	.00	5.	
1.00	6.40	80	.00	.00	.00	0.	1.00	18.40	224	.00	.01	.00	5.	
1.00	6.45	81	.00	.00	.00	0.	1.00	18.45	225	.00	.01	.00	5.	
1.00	6.50	82	.00	.00	.00	0.	1.00	18.50	226	.00	.01	.00	5.	
1.00	6.55	83	.00	.00	.00	0.	1.00	18.55	227	.00	.01	.00	5.	
1.00	7.00	84	.00	.00	.00	0.	1.00	19.00	228	.00	.01	.00	5.	
1.00	7.05	85	.00	.00	.00	0.	1.00	19.05	229	.00	.01	.00	5.	

1.01	7.10	96	.01	.01	.01	2.	1.01	19.90	270	.01	.01	.00	5.
1.01	7.15	97	.01	.01	.01	2.	1.01	19.85	271	.01	.01	.00	5.
1.01	7.20	98	.01	.01	.01	2.	1.01	19.90	272	.01	.01	.00	5.
1.01	7.25	99	.01	.01	.01	2.	1.01	19.95	273	.01	.01	.00	5.
1.01	7.30	100	.01	.01	.01	2.	1.01	20.00	274	.01	.01	.00	5.
1.01	7.35	101	.01	.01	.01	2.	1.01	20.05	275	.01	.01	.00	5.
1.01	7.40	102	.01	.01	.01	2.	1.01	20.10	276	.01	.01	.00	5.
1.01	7.45	103	.01	.01	.01	2.	1.01	20.15	277	.01	.01	.00	5.
1.01	7.50	104	.01	.01	.01	2.	1.01	20.20	278	.01	.01	.00	5.
1.01	7.55	105	.01	.01	.01	2.	1.01	20.25	279	.01	.01	.00	5.
1.01	7.60	106	.01	.01	.01	3.	1.01	20.30	280	.01	.01	.00	5.
1.01	7.65	107	.01	.01	.01	3.	1.01	20.35	281	.01	.01	.00	5.
1.01	7.70	108	.01	.01	.01	3.	1.01	20.40	282	.01	.01	.00	5.
1.01	7.75	109	.01	.01	.01	3.	1.01	20.45	283	.01	.01	.00	5.
1.01	7.80	110	.01	.01	.01	3.	1.01	20.50	284	.01	.01	.00	5.
1.01	7.85	111	.01	.01	.01	3.	1.01	20.55	285	.01	.01	.00	5.
1.01	7.90	112	.01	.01	.01	3.	1.01	20.60	286	.01	.01	.00	5.
1.01	7.95	113	.01	.01	.01	3.	1.01	20.65	287	.01	.01	.00	5.
1.01	8.00	114	.01	.01	.01	3.	1.01	20.70	288	.01	.01	.00	5.
1.01	8.05	115	.01	.01	.01	3.	1.01	20.75	289	.01	.01	.00	5.
1.01	8.10	116	.01	.01	.01	3.	1.01	20.80	290	.01	.01	.00	5.
1.01	8.15	117	.01	.01	.01	3.	1.01	20.85	291	.01	.01	.00	5.
1.01	8.20	118	.01	.01	.01	3.	1.01	20.90	292	.01	.01	.00	5.
1.01	8.25	119	.01	.01	.01	3.	1.01	20.95	293	.01	.01	.00	5.
1.01	8.30	120	.01	.01	.01	3.	1.01	21.00	294	.01	.01	.00	5.
1.01	8.35	121	.01	.01	.01	3.	1.01	21.05	295	.01	.01	.00	5.
1.01	8.40	122	.01	.01	.01	3.	1.01	21.10	296	.01	.01	.00	5.
1.01	8.45	123	.01	.01	.01	3.	1.01	21.15	297	.01	.01	.00	5.
1.01	8.50	124	.01	.01	.01	3.	1.01	21.20	298	.01	.01	.00	5.
1.01	8.55	125	.01	.01	.01	3.	1.01	21.25	299	.01	.01	.00	5.
1.01	8.60	126	.01	.01	.01	3.	1.01	21.30	300	.01	.01	.00	5.
1.01	8.65	127	.01	.01	.01	3.	1.01	21.35	301	.01	.01	.00	5.
1.01	8.70	128	.01	.01	.01	3.	1.01	21.40	302	.01	.01	.00	5.
1.01	8.75	129	.01	.01	.01	3.	1.01	21.45	303	.01	.01	.00	5.
1.01	8.80	130	.01	.01	.01	3.	1.01	21.50	304	.01	.01	.00	5.
1.01	8.85	131	.01	.01	.01	3.	1.01	21.55	305	.01	.01	.00	5.
1.01	8.90	132	.01	.01	.01	3.	1.01	21.60	306	.01	.01	.00	5.
1.01	8.95	133	.01	.01	.01	3.	1.01	21.65	307	.01	.01	.00	5.
1.01	9.00	134	.01	.01	.01	3.	1.01	21.70	308	.01	.01	.00	5.
1.01	9.05	135	.01	.01	.01	3.	1.01	21.75	309	.01	.01	.00	5.
1.01	9.10	136	.01	.01	.01	3.	1.01	21.80	310	.01	.01	.00	5.
1.01	9.15	137	.01	.01	.01	3.	1.01	21.85	311	.01	.01	.00	5.
1.01	9.20	138	.01	.01	.01	3.	1.01	21.90	312	.01	.01	.00	5.
1.01	9.25	139	.01	.01	.01	3.	1.01	21.95	313	.01	.01	.00	5.
1.01	9.30	140	.01	.01	.01	3.	1.01	22.00	314	.01	.01	.00	5.
1.01	9.35	141	.01	.01	.01	3.	1.01	22.05	315	.01	.01	.00	5.
1.01	9.40	142	.01	.01	.01	3.	1.01	22.10	316	.01	.01	.00	5.
1.01	9.45	143	.01	.01	.01	3.	1.01	22.15	317	.01	.01	.00	5.
1.01	9.50	144	.01	.01	.01	3.	1.01	22.20	318	.01	.01	.00	5.
1.01	9.55	145	.01	.01	.01	3.	1.01	22.25	319	.01	.01	.00	5.
1.01	9.60	146	.01	.01	.01	3.	1.01	22.30	320	.01	.01	.00	5.
1.01	9.65	147	.01	.01	.01	3.	1.01	22.35	321	.01	.01	.00	5.
1.01	9.70	148	.01	.01	.01	3.	1.01	22.40	322	.01	.01	.00	5.
1.01	9.75	149	.01	.01	.01	3.	1.01	22.45	323	.01	.01	.00	5.
1.01	9.80	150	.01	.01	.01	3.	1.01	22.50	324	.01	.01	.00	5.
1.01	9.85	151	.01	.01	.01	3.	1.01	22.55	325	.01	.01	.00	5.
1.01	9.90	152	.01	.01	.01	3.	1.01	22.60	326	.01	.01	.00	5.
1.01	9.95	153	.01	.01	.01	3.	1.01	22.65	327	.01	.01	.00	5.
1.01	10.00	154	.01	.01	.01	3.	1.01	22.70	328	.01	.01	.00	5.
1.01	10.05	155	.01	.01	.01	3.	1.01	22.75	329	.01	.01	.00	5.
1.01	10.10	156	.01	.01	.01	3.	1.01	22.80	330	.01	.01	.00	5.
1.01	10.15	157	.01	.01	.01	3.	1.01	22.85	331	.01	.01	.00	5.
1.01	10.20	158	.01	.01	.01	3.	1.01	22.90	332	.01	.01	.00	5.
1.01	10.25	159	.01	.01	.01	3.	1.01	22.95	333	.01	.01	.00	5.
1.01	10.30	160	.01	.01	.01	3.	1.01	23.00	334	.01	.01	.00	5.
1.01	10.35	161	.01	.01	.01	3.	1.01	23.05	335	.01	.01	.00	5.
1.01	10.40	162	.01	.01	.01	3.	1.01	23.10	336	.01	.01	.00	5.
1.01	10.45	163	.01	.01	.01	3.	1.01	23.15	337	.01	.01	.00	5.
1.01	10.50	164	.01	.01	.01	3.	1.01	23.20	338	.01	.01	.00	5.
1.01	10.55	165	.01	.01	.01	3.	1.01	23.25	339	.01	.01	.00	5.
1.01	10.60	166	.01	.01	.01	3.	1.01	23.30	340	.01	.01	.00	5.
1.01	10.65	167	.01	.01	.01	3.	1.01	23.35	341	.01	.01	.00	5.
1.01	10.70	168	.01	.01	.01	3.	1.01	23.40	342	.01	.01	.00	5.
1.01	10.75	169	.01	.01	.01	3.	1.01	23.45	343	.01	.01	.00	5.
1.01	10.80	170	.01	.01	.01	3.	1.01	23.50	344	.01	.01	.00	5.

1.01	10.85	171	.01	.01	.01	3.	1.01	23.55	345	.01	.01	.00	5.
1.01	10.90	172	.01	.01	.01	3.	1.01	23.60	346	.01	.01	.00	5.
1.01	10.95	173	.01	.01	.01	3.	1.01	23.65	347	.01	.01	.00	5.
1.01	11.00	174	.01	.01	.01	3.	1.01	23.70	348	.01	.01	.00	5.
1.01	11.05	175	.01	.01	.01	3.	1.01	23.75	349	.01	.01	.00	5.
1.01	11.10	176	.01	.01	.01	3.	1.01	23.80	350	.01	.01	.00	5.
1.01	11.15	177	.01	.01	.01	3.	1.01	23.85	351	.01	.01	.00	5.
1.01	11.20	178	.01	.01	.01	3.	1.01	23.90	352	.01	.01	.00	5.
1.01	11.25	179	.01	.01	.01	3.	1.01	23.95	353	.01	.01	.00	5.
1.01	11.30	180	.01	.01	.01	3.	1.01	24.00	354	.01	.01	.00	5.
1.01	11.35	181	.01	.01	.01	3.	1.01	24.05	355	.01	.01	.00	5.
1.01	11.40	182	.01	.01	.01	3.	1.01	24.10	356	.01	.01	.00	5.
1.01	11.45	183	.01	.01	.01	3.	1.01	24.15	357	.01	.01	.00	5.
1.01	11.50	184	.01	.01	.01	3.	1.01	24.20	358	.01	.01	.00	5.
1.01	11.55	185	.01	.01	.01	3.	1.01	24.25	359	.01	.01	.00	5.
1.01	11.60	186	.01	.01	.01	3.	1.01	24.30	360	.01	.01	.00	5.
1.01	11.65	187	.01	.01	.01	3.	1.01	24.35	361	.01	.01	.00	5.
1.01	11.70	188	.01	.01	.01	3.	1.01	24.40	362	.01	.01	.00	5.
1.01	11.75	189	.01	.01	.01	3.	1.01	24.45	363	.01	.01	.00	5.
1.01	11.80	190	.01	.01	.01	3.	1.01	24.50	364	.01	.01	.00	5.
1.01	11.85	191	.01	.01	.01	3.	1.01	24.55	365	.01	.01	.00	5.
1.01	11.90	192	.01	.01	.01	3.	1.01	24.60	366	.01	.01	.00	5.
1.01	11.95	193	.01	.01	.01	3.	1.01	24.65	367	.01	.01	.00	5.
1.01	12.00	194	.01	.01	.01	3.	1.01	24.70	368	.01	.01	.00	5.
1.01	12.05	195	.01	.01	.01	3.	1.01	24.75	369	.01	.01	.00	5.
1.01	12.10	196	.01	.01	.01	3.	1.01	24.80	370	.01	.01	.00	5.
1.01	12.15	197	.01	.01	.01	3.	1.01	24.85	371	.01	.01	.00	5.
1.01	12.20	198	.01	.01	.01	3.	1.01	24.90	372	.01	.01	.00	5.
1.01	12.25	199	.01	.01	.01	3.	1.01	24.95	373	.01	.01	.00	5.
1.01	12.30	200	.01	.01	.01	3.	1.01	25.00	374	.01	.01	.00	5.
1.01	12.35	201	.01	.01	.01	3.	1.01	25.05	375	.01	.01	.00	5.
1.01	12.40	202	.01	.01	.01	3.	1.01	25.10	376	.01	.01	.00	5.
1.01	12.45	203	.01	.01	.01	3.	1.01	25.15	377	.01	.01	.00	5.
1.01	12.50	204	.01	.01	.01	3.	1.01	25.20	378	.01	.01	.00	5.
1.01	12.55	205	.01	.01	.01	3.	1.01	25.25	379	.01	.01	.00	5.
1.01	12.60	206	.01	.01	.01	3.	1.01	25.30	380	.01	.01	.00	5.
1.01	12.65	207	.01	.01	.01	3.	1.01	25.35	381	.01	.01	.00	5.
1.01	12.70	208	.01	.01	.01	3.	1.01	25.40	382	.01	.01	.00	5.
1.01	12.75	209	.01	.01	.01	3.	1.01	25.45	383	.01	.01	.00	5.
1.01	12.80	210	.01	.01	.01	3.	1.01	25.50	384	.01	.01	.00	5.

1.01	11.30	138	.08	.05	.03	38.	1.01	23.30	282	.01	.01	.00	5.
1.01	11.35	139	.12	.08	.04	41.	1.01	23.35	283	.01	.01	.00	5.
1.01	11.40	140	.12	.08	.04	42.	1.01	23.40	284	.01	.01	.00	5.
1.01	11.45	141	.12	.08	.03	94.	1.01	23.45	285	.01	.01	.00	5.

FLOOD HYDROGRAPH PACKAGE - HEC-1 PROGRAM H21/02-1V TIME 13:17:44 CASE

1.01	11.50	142	.24	.18	.06	65.	1.01	23.50	286	.01	.01	.00	5.
1.01	11.55	143	.24	.18	.05	83.	1.01	23.55	287	.01	.01	.00	5.
1.01	12.00	144	.55	.45	.11	116.	1.02	.00	288	.01	.01	.00	5.
									SUM	7.44	5.33	2.11	4096.
										(189.)(	135.)(	54.)(	115.99)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	378.	47.	14.	14.	4112.
CMS	9.	1.	0.	0.	116.
INCHES		4.33	5.31	5.31	5.31	
MM		109.97	134.93	134.93	134.93
AC-FT		23.	28.	28.	28.
THOUS CU M		28.	35.	35.	35.

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	3	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
.0	.00	.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	.000	.000	.000	-684.	-1

STAGE	444.00	444.50	465.00	686.00	687.00	688.00	689.00	690.00	692.00
FLOW	.0	11.00	24.00	72.00	148.00	278.00	434.00	625.00	1350.00
SURFACE AREA=	0.	6.	9.	12.					
CAPACITY=	0.	53.	97.	102.					
ELEVATION=	444.	444.	465.	7.0.					

ENEL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
694.0	.0	.6	.0	.0	.0	.0	.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
695.5	.6	.0	0.

CREST LENGTH	150.	210.	290.	525.	450.	650.
AT ELEVATION	695.5	695.7	696.0	696.2	696.5	697.0

END-OF-PERIOD HYDROGRAPH ORDINATES

1.01	.05	1	.08	0.	0.	50.	684.0
1.01	.10	2	.17	0.	0.	50.	684.0
1.01	.15	3	.25	0.	0.	50.	684.0
1.01	.20	4	.33	0.	0.	50.	684.0
1.01	.25	5	.42	0.	0.	50.	684.0
1.01	.30	6	.50	0.	0.	50.	684.0
1.01	.35	7	.58	0.	0.	50.	684.0
1.01	.40	8	.67	0.	0.	50.	684.0
1.01	.45	9	.75	0.	0.	50.	684.0
1.01	.50	10	.83	0.	0.	50.	684.0
1.01	.55	11	.92	0.	0.	50.	684.0
1.01	1.00	12	1.00	0.	0.	50.	684.0
1.01	1.05	13	1.08	0.	0.	50.	684.0
1.01	1.10	14	1.17	0.	0.	50.	684.0
1.01	1.15	15	1.25	0.	0.	50.	684.0
1.01	1.20	16	1.33	0.	0.	50.	684.0
1.01	1.25	17	1.42	0.	0.	50.	684.0
1.01	1.30	18	1.50	0.	0.	50.	684.0
1.01	1.35	19	1.58	0.	0.	50.	684.0
1.01	1.40	20	1.67	0.	0.	50.	684.0
1.01	1.45	21	1.75	0.	0.	50.	684.0
1.01	1.50	22	1.83	0.	0.	50.	684.0
1.01	1.55	23	1.92	0.	0.	50.	684.0
1.01	1.60	24	2.00	0.	0.	50.	684.0
1.01	1.65	25	2.08	0.	0.	50.	684.0
1.01	1.70	26	2.17	0.	0.	50.	684.0
1.01	1.75	27	2.25	0.	0.	50.	684.0
1.01	1.80	28	2.33	0.	0.	50.	684.0
1.01	1.85	29	2.42	0.	0.	50.	684.0
1.01	1.90	30	2.50	0.	0.	50.	684.0
1.01	1.95	31	2.58	0.	0.	50.	684.0
1.01	2.00	32	2.67	0.	0.	50.	684.0
1.01	2.05	33	2.75	0.	0.	50.	684.0
1.01	2.10	34	2.83	0.	0.	50.	684.0
1.01	2.15	35	2.92	0.	0.	50.	684.0
1.01	2.20	36	3.00	0.	0.	50.	684.0
1.01	2.25	37	3.08	0.	0.	50.	684.0
1.01	2.30	38	3.17	0.	0.	50.	684.0
1.01	2.35	39	3.25	0.	0.	50.	684.0
1.01	2.40	40	3.33	0.	0.	50.	684.0
1.01	2.45	41	3.42	0.	0.	50.	684.0
1.01	2.50	42	3.50	0.	0.	50.	684.0
1.01	2.55	43	3.58	0.	0.	50.	684.0
1.01	2.60	44	3.67	0.	0.	50.	684.0
1.01	2.65	45	3.75	0.	0.	50.	684.0
1.01	2.70	46	3.83	0.	0.	50.	684.0
1.01	2.75	47	3.92	0.	0.	50.	684.0
1.01	2.80	48	4.00	0.	0.	50.	684.0
1.01	2.85	49	4.08	0.	0.	50.	684.0
1.01	2.90	50	4.17	0.	0.	50.	684.0
1.01	2.95	51	4.25	0.	0.	50.	684.0
1.01	3.00	52	4.33	0.	0.	50.	684.0
1.01	3.05	53	4.42	0.	0.	50.	684.0
1.01	3.10	54	4.50	0.	0.	50.	684.0

1.01	3.15	55	4.58	0.	0.	50.	684.0

1.01	4.15	51	4.25	0.	0.	50.	6E4.0	
1.01	4.20	52	4.33	0.	0.	50.	6E4.0	
1.01	4.25	53	4.42	0.	0.	50.	6E4.0	
1.01	4.30	54	4.50	0.	0.	50.	6E4.0	
1.01	4.35	55	4.58	0.	0.	50.	6E4.0	
1.01	4.40	56	4.67	0.	0.	50.	6E4.0	
1.01	4.45	57	4.75	0.	0.	50.	6E4.0	
1.01	4.50	58	4.83	0.	0.	50.	6E4.0	
1.01	4.55	59	4.92	0.	0.	50.	6E4.0	
1.01	5.00	60	5.00	0.	0.	50.	6E4.0	
1.01	5.05	61	5.08	0.	0.	50.	6E4.0	
1.01	5.10	62	5.17	0.	0.	50.	6E4.0	
1.01	5.15	63	5.25	0.	0.	50.	6E4.0	
1.01	5.20	64	5.33	0.	0.	50.	6E4.0	
1.01	5.25	65	5.42	0.	0.	50.	6E4.0	
1.01	5.30	66	5.50	0.	0.	50.	6E4.0	
1.01	5.35	67	5.58	0.	0.	50.	6E4.0	
1.01	5.40	68	5.67	0.	0.	50.	6E4.0	
1.01	5.45	69	5.75	0.	0.	50.	6E4.0	
1.01	5.50	70	5.83	0.	0.	50.	6E4.0	
1.01	5.55	71	5.92	0.	0.	50.	6E4.0	
1.01	6.00	72	6.00	0.	0.	50.	6E4.0	
1.01	6.05	73	6.08	0.	0.	50.	6E4.0	
1.01	6.10	74	6.17	0.	0.	50.	6E4.0	
1.01	6.15	75	6.25	0.	0.	50.	6E4.0	
1.01	6.20	76	6.33	1.	0.	50.	6E4.0	
1.01	6.25	77	6.42	1.	0.	50.	6E4.0	
1.01	6.30	78	6.50	1.	0.	50.	6E4.0	
1.01	6.35	79	6.58	1.	0.	50.	6E4.0	
1.01	6.40	80	6.67	1.	0.	50.	6E4.0	
1.01	6.45	81	6.75	1.	0.	50.	6E4.0	
1.01	6.50	82	6.83	1.	0.	50.	6E4.0	
1.01	6.55	83	6.92	1.	0.	50.	6E4.0	
1.01	7.00	84	7.00	1.	0.	50.	6E4.0	
1.01	7.05	85	7.08	2.	0.	50.	6E4.0	
1.01	7.10	86	7.17	2.	0.	50.	6E4.0	
1.01	7.15	87	7.25	2.	0.	50.	6E4.0	
1.01	7.20	88	7.33	2.	0.	51.	6E4.0	
1.01	7.25	89	7.42	2.	0.	51.	6E4.0	
1.01	7.30	90	7.50	2.	0.	51.	6E4.0	
1.01	7.35	91	7.58	2.	0.	51.	6E4.0	
1.01	7.40	92	7.67	2.	1.	51.	6E4.0	
1.01	7.45	93	7.75	2.	1.	51.	6E4.0	
1.01	7.50	94	7.83	2.	1.	51.	6E4.0	
1.01	7.55	95	7.92	2.	1.	51.	6E4.0	
1.01	8.00	96	8.00	3.	1.	51.	6E4.0	
1.01	8.05	97	8.08	3.	1.	51.	6E4.0	
1.01	8.10	98	8.17	3.	1.	51.	6E4.0	
1.01	8.15	99	8.25	3.	1.	51.	6E4.0	
1.01	8.20	100	8.33	3.	1.	51.	6E4.0	
1.01	8.25	101	8.42	3.	1.	51.	6E4.0	
1.01	8.30	102	8.50	3.	1.	51.	6E4.0	
1.01	8.35	103	8.58	3.	1.	51.	6E4.0	
1.01	8.40	104	8.67	3.	1.	51.	6E4.0	
1.01	8.45	105	8.75	3.	1.	51.	6E4.0	
1.01	8.50	106	8.83	3.	1.	51.	6E4.1	
1.01	8.55	107	8.92	3.	1.	51.	6E4.1	
1.01	9.00	108	9.00	4.	1.	51.	6E4.1	
1.01	9.05	109	9.08	4.	1.	51.	6E4.1	
1.01	9.10	110	9.17	4.	1.	51.	6E4.1	

	1.01	9.15	111	9.25	4.	1.	51.	6P4.1
	1.01	9.20	112	9.33	6.	2.	51.	6P4.1
	1.01	9.25	113	9.42	7.	2.	51.	6P4.1
	1.01	9.30	114	9.50	8.	2.	51.	6P4.1
	1.01	9.35	115	9.58	8.	2.	51.	6P4.1
	1.01	9.40	116	9.67	8.	2.	51.	6P4.1
	1.01	9.45	117	9.75	8.	2.	51.	6P4.1
	1.01	9.50	118	9.83	9.	2.	51.	6P4.1
	1.01	9.55	119	9.92	9.	3.	51.	6P4.1
	1.01	10.00	120	10.00	9.	3.	51.	6P4.1
	1.01	10.05	121	10.08	9.	3.	51.	6P4.1
	1.01	10.10	122	10.17	9.	3.	51.	6P4.1
	1.01	10.15	123	10.25	10.	3.	51.	6P4.1
	1.01	10.20	124	10.33	10.	3.	51.	6P4.1
	1.01	10.25	125	10.42	10.	3.	51.	6P4.2
	1.01	10.30	126	10.50	10.	4.	51.	6P4.2
	1.01	10.35	127	10.58	10.	4.	51.	6P4.2
	1.01	10.40	128	10.67	11.	4.	52.	6P4.2
	1.01	10.45	129	10.75	11.	4.	52.	6P4.2
	1.01	10.50	130	10.83	12.	4.	52.	6P4.2
	1.01	10.55	131	10.92	12.	4.	52.	6P4.2
	1.01	11.00	132	11.00	12.	5.	52.	6P4.2
	1.01	11.05	133	11.08	14.	5.	52.	6P4.2
	1.01	11.10	134	11.17	19.	5.	52.	6P4.2
	1.01	11.15	135	11.25	24.	5.	52.	6P4.2
	1.01	11.20	136	11.33	31.	6.	52.	6P4.3
	1.01	11.25	137	11.42	35.	7.	52.	6P4.3
	1.01	11.30	138	11.50	38.	7.	53.	6P4.3
	1.01	11.35	139	11.58	41.	8.	57.	6P4.4
	1.01	11.40	140	11.67	47.	9.	57.	6P4.4
	1.01	11.45	141	11.75	54.	10.	57.	6P4.4
	1.01	11.50	142	11.83	65.	11.	54.	6P4.5
	1.01	11.55	143	11.92	83.	13.	56.	6P4.6
	1.01	12.00	144	12.00	116.	16.	55.	6P4.7
	1.01	12.05	145	12.08	169.	20.	56.	6P4.8
	1.01	12.10	146	12.17	274.	27.	57.	6P5.0
	1.01	12.15	147	12.25	509.	39.	59.	6P5.3
	1.01	12.20	148	12.33	277.	54.	60.	6P5.5
	1.01	12.25	149	12.42	215.	109.	62.	6P5.7
	1.01	12.30	150	12.50	164.	142.	62.	6P5.8
	1.01	12.35	151	12.58	129.	144.	62.	6P5.8
	1.01	12.40	152	12.67	104.	132.	62.	6P5.8
	1.01	12.45	153	12.75	85.	116.	62.	6P5.7
	1.01	12.50	154	12.83	73.	103.	61.	6P5.7
	1.01	12.55	155	12.92	66.	91.	61.	6P5.7
	1.01	13.00	156	13.00	62.	83.	61.	6P5.6
	1.01	13.05	157	13.08	59.	76.	61.	6P5.6
	1.01	13.10	158	13.17	49.	70.	61.	6P5.6
	1.01	13.15	159	13.25	39.	63.	61.	6P5.6
	1.01	13.20	160	13.33	31.	57.	61.	6P5.6
	1.01	13.25	161	13.42	26.	52.	60.	6P5.5
	1.01	13.30	162	13.50	24.	49.	60.	6P5.5
	1.01	13.35	163	13.58	22.	48.	60.	6P5.5
	1.01	13.40	164	13.67	21.	47.	60.	6P5.4
	1.01	13.45	165	13.75	20.	45.	60.	6P5.4
	1.01	13.50	166	13.83	19.	44.	59.	6P5.4

	1.01	13.55	167	13.92	19.	43.	59.	6P5.4

1.01	13.35	167	13.58	22.	48.	60.	685.5
1.01	13.40	168	13.67	21.	47.	60.	685.4
1.01	13.45	169	13.75	20.	45.	60.	685.4
1.01	13.50	170	13.83	19.	44.	59.	685.4

1.01	13.55	167	13.92	19.	43.	59.	685.4
1.01	14.00	168	14.00	19.	42.	59.	685.3
1.01	14.05	169	14.08	19.	41.	59.	685.3
1.01	14.10	170	14.17	19.	40.	59.	685.3
1.01	14.15	171	14.25	19.	39.	59.	685.3
1.01	14.20	172	14.33	19.	38.	59.	685.3
1.01	14.25	173	14.42	19.	37.	58.	685.2
1.01	14.30	174	14.50	19.	36.	58.	685.2
1.01	14.35	175	14.58	19.	35.	58.	685.2
1.01	14.40	176	14.67	19.	35.	58.	685.2
1.01	14.45	177	14.75	19.	34.	58.	685.2
1.01	14.50	178	14.83	19.	33.	58.	685.2
1.01	14.55	179	14.92	19.	33.	58.	685.1
1.01	15.00	180	15.00	19.	32.	58.	685.1
1.01	15.05	181	15.08	18.	31.	58.	685.1
1.01	15.10	182	15.17	18.	31.	58.	685.1
1.01	15.15	183	15.25	18.	30.	57.	685.1
1.01	15.20	184	15.33	17.	29.	57.	685.1
1.01	15.25	185	15.42	17.	28.	57.	685.1
1.01	15.30	186	15.50	17.	27.	57.	685.0
1.01	15.35	187	15.58	17.	27.	57.	685.0
1.01	15.40	188	15.67	16.	26.	57.	685.0
1.01	15.45	189	15.75	16.	25.	57.	685.0
1.01	15.50	190	15.83	9.	25.	57.	685.0
1.01	15.55	191	15.92	9.	24.	57.	684.9
1.01	16.00	192	16.00	9.	24.	57.	684.9
1.01	16.05	193	16.08	9.	24.	56.	684.9
1.01	16.10	194	16.17	9.	23.	56.	684.9
1.01	16.15	195	16.25	9.	23.	56.	684.9
1.01	16.20	196	16.33	9.	22.	56.	684.9
1.01	16.25	197	16.42	9.	22.	56.	684.9
1.01	16.30	198	16.50	9.	22.	56.	684.9
1.01	16.35	199	16.58	9.	21.	56.	684.8
1.01	16.40	200	16.67	9.	21.	56.	684.8
1.01	16.45	201	16.75	9.	20.	56.	684.8
1.01	16.50	202	16.83	9.	20.	56.	684.8
1.01	16.55	203	16.92	9.	20.	55.	684.8
1.01	17.00	204	17.00	9.	19.	55.	684.8
1.01	17.05	205	17.08	9.	19.	55.	684.8
1.01	17.10	206	17.17	9.	19.	55.	684.8
1.01	17.15	207	17.25	9.	19.	55.	684.8
1.01	17.20	208	17.33	9.	18.	55.	684.7
1.01	17.25	209	17.42	9.	18.	55.	684.7
1.01	17.30	210	17.50	9.	18.	55.	684.7
1.01	17.35	211	17.58	9.	18.	55.	684.7
1.01	17.40	212	17.67	9.	17.	55.	684.7
1.01	17.45	213	17.75	9.	17.	55.	684.7
1.01	17.50	214	17.83	9.	17.	55.	684.7
1.01	17.55	215	17.92	9.	17.	54.	684.7
1.01	18.00	216	18.00	9.	16.	55.	684.7
1.01	18.05	217	18.08	9.	16.	55.	684.7
1.01	18.10	218	18.17	8.	16.	55.	684.7
1.01	18.15	219	18.25	7.	16.	55.	684.7
1.01	18.20	220	18.33	6.	15.	54.	684.6
1.01	18.25	221	18.42	6.	15.	54.	684.6
1.01	18.30	222	18.50	5.	15.	54.	684.6

1.01	19.35	247	19.42	5.	14.	54.	6R4.6	
1.01	19.40	246	19.47	5.	14.	54.	6R4.6	
1.01	19.45	249	19.75	5.	14.	54.	6R4.6	
1.01	19.50	250	19.83	5.	14.	54.	6R4.6	
1.01	19.55	251	19.92	5.	13.	54.	6R4.6	
1.01	20.00	252	20.00	5.	13.	54.	6R4.6	
1.01	20.05	253	20.08	5.	13.	54.	6R4.6	
1.01	20.10	254	20.17	5.	13.	54.	6R4.6	
1.01	20.15	255	20.25	5.	12.	54.	6R4.5	
1.01	20.20	256	20.33	5.	12.	54.	6R4.5	
1.01	20.25	257	20.42	5.	12.	54.	6R4.5	
1.01	20.30	258	20.50	5.	12.	54.	6R4.5	
1.01	20.35	259	20.58	5.	12.	54.	6R4.5	
1.01	20.40	260	20.67	5.	11.	54.	6R4.5	
1.01	20.45	261	20.75	5.	11.	54.	6R4.5	
1.01	20.50	262	20.83	5.	11.	54.	6R4.5	
1.01	20.55	263	20.92	5.	11.	54.	6R4.5	
1.01	21.00	264	21.00	5.	11.	53.	6R4.5	
1.01	21.05	265	21.08	5.	11.	53.	6R4.5	
1.01	21.10	266	21.17	5.	10.	53.	6R4.5	
1.01	21.15	267	21.25	5.	10.	53.	6R4.5	
1.01	21.20	268	21.33	5.	10.	53.	6R4.5	
1.01	21.25	269	21.42	5.	10.	53.	6R4.5	
1.01	21.30	270	21.50	5.	10.	53.	6R4.5	
1.01	21.35	271	21.58	5.	10.	53.	6R4.4	
1.01	21.40	272	21.67	5.	10.	53.	6R4.4	
1.01	21.45	273	21.75	5.	10.	53.	6R4.4	
1.01	21.50	274	21.83	5.	10.	53.	6R4.4	
1.01	21.55	275	21.92	5.	10.	53.	6R4.4	
1.01	22.00	276	22.00	5.	9.	53.	6R4.4	
1.01	22.05	277	22.08	5.	9.	53.	6R4.4	
1.01	22.10	278	22.17	5.	9.	53.	6R4.4	
1.01	22.15	279	22.25	5.	9.	53.	6R4.4	
1.01	22.20	280	22.33	5.	9.	53.	6R4.4	
1.01	22.25	281	22.42	5.	9.	53.	6R4.4	
1.01	22.30	282	22.50	5.	9.	53.	6R4.4	
1.01	22.35	283	22.58	5.	9.	53.	6R4.4	
1.01	22.40	284	22.67	5.	9.	53.	6R4.4	
1.01	22.45	285	22.75	5.	8.	53.	6R4.3	
1.01	22.50	286	22.83	5.	8.	53.	6R4.3	
1.01	22.55	287	22.92	5.	8.	53.	6R4.3	
1.01	23.00	288	23.00	5.	8.	53.	6R4.3	
1.01	23.05	289	23.08	5.	7.	53.	6R4.3	
1.01	23.10	290	23.17	5.	7.	53.	6R4.3	

1.01	23.15	291	23.25	5.	7.	53.	6R4.3	

1.01	22.55	275	22.92	5.	8.	53.	684.3
1.01	23.00	276	23.00	5.	8.	53.	684.3
1.01	23.05	277	23.08	5.	7.	53.	684.3
1.01	23.10	278	23.17	5.	7.	53.	684.3

FLOOD HYDROGRAPH PACKAGE - HEC-1 PROGRAM H21/02-1V TIME 13:17:44 CASE

1.01	23.15	279	23.25	5.	7.	53.	684.3
1.01	23.20	280	23.33	5.	7.	53.	684.3
1.01	23.25	281	23.42	5.	7.	52.	684.3
1.01	23.30	282	23.50	5.	7.	52.	684.3
1.01	23.35	283	23.58	5.	7.	52.	684.3
1.01	23.40	284	24.07	5.	7.	52.	684.3
1.01	23.45	285	24.15	5.	7.	52.	684.3
1.01	23.50	286	24.23	5.	7.	52.	684.3
1.01	23.55	287	24.32	5.	7.	52.	684.3
1.02	.00	288	24.40	5.	7.	52.	684.3

PEAK OUTFLOW IS 144. AT TIME 12.58 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	144.	41.	13.	13.	3830.
CMS	4.	1.	0.	0.	108.
INCHES		3.78	4.95	4.95	4.95
MM		95.97	125.68	125.68	125.68
AC-FT		20.	26.	26.	26.
THOUS CU M		25.	33.	33.	33.

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	HEAD	539.	47.	14.	14.	.10
	(	15.26)(	1.32)(	.40)(	.40)(	.26)
ROUTED TO	DAM	144.	41.	13.	13.	.10
	(	4.08)(	1.15)(	.38)(	.38)(	.26)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	6P4.00	684.00	6P5.50
STORAGE	50.	50.	69.
OUTFLOW	0.	0.	49.

	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
100-year		6P5.77	.27	62.	144.	1.17	12.58	.00

PFIN

H21TL4 FIN

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B L A C K   &   V E A T C H                                   PROGRAM  H21/02-1      PAGE    1
LISTING OF INPUT DATA                                        DATE  26 MAR 81   TIME  08:45:51

          JOBCARD
          1111111111222222222233333333334444444444555555555566666666677777777778
SEQ #  CYS # 12345678901234567890123456789012345678901234567890123456789012345678901234567890

     1         * H21  C2-1  6457
     2         A1       MISSOURI DAM INSPECTIONS
     3         A2       LAKE CYCLONE DAM
     4         A3       10 YEAR
     5         U    25                5                              3
     6         B1       2
     7         K             HEAD                                  1
     8         K1       COMPUTE INFLOW HYDROGRAPH
     9         M                 23.1                1.0
    10         O    25   5.213                    BA #     .50
    11         O1   .03   .005    .005    .005    .005    .005    .005    .005    .005    .005
    12         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    13         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    14         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    15         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    16         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    17         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    18         O1   .005  .005    .011    .011    .011    .011    .011    .011    .011    .011
    19         O1   .011  .011    .011    .011    .011    .011    .011    .011    .011    .011
    20         O1   .011  .011    .011    .011    .011    .011    .011    .011    .011    .011
    21         O1   .011  .011    .011    .011    .011    .011    .011    .011    .015    .015
    22         O1   .015  .015    .015    .015    .015    .015    .015    .015    .015    .015
    23         O1   .015  .015    .015    .015    .015    .015    .029    .029    .029    .029
    24         O1   .029  .029    .059    .059    .059    .060    .060    .060    .079    .079
    25         O1   .079  .151    .151    .377    .593    .259    .151    .079    .079    .079
    26         O1   .060  .060    .060    .060    .059    .059    .029    .029    .029    .029
    27         O1   .029  .029    .015    .015    .015    .015    .015    .015    .015    .015
    28         O1   .015  .015    .015    .015    .015    .015    .015    .015    .015    .015
    29         O1   .011  .011    .011    .011    .011    .011    .011    .011    .011    .011
    30         O1   .011  .011    .011    .011    .011    .011    .011    .011    .011    .011
    31         O1   .011  .011    .011    .011    .011    .011    .011    .011    .011    .011
    32         O1   .011  .011    .011    .011    .011    .011    .005    .005    .005    .005
    33         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    34         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    35         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    36         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    37         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    38         O1   .005  .005    .005    .005    .005    .005    .005    .005    .005    .005
    39         O1   .005  .005    .005    .005    .005    .005    .005    .005
    40         T                                                        -1-.2.
    41         M2       0.20
    42         A                1.
    43         A    1      DAM                                  1
    44         K1       ROUTE HYDROGRAPH THROUGH DAM
    45         Y                         1       1
    46         Y1   1                                    -684.          -1
    47         Y46*4.  694.5   695.    686.    677.    668.    659.    650.    642.
    48         Y50.    11.     36.     72.     145.    278.    494.    825.    1050.
    49         SAU.    6.3     7.1     11.7
    50         SEC*J.  694.    686.    677.
```

LISTING OF INPUT DATA DATE 26 MAR 81 TIME 08:45:51

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                  1111111111222222222233333333334444444445555555556666666667777777778
SEQ #  CTS #  12345678901234567890123456789012345678901234567890123456789012345678901234567890

   51         $$6F4.
   52         $D695.5
   53         $L15J.  215.    3P9.    525.    6PJ.    650.
   54         $V685.5 6P5.7   6P0.    6P6.2   686.3   690.
   55         K      99
   56         A
   57         A
   58         A
   59         A
   60         A

BASG,A SYSLIB*ADD.
FAC WARNING        C4020D0D4J00

BASG,A SYSLIB*UG7.
FAC WARNING        C4020D0D4J00

BASG,A SYSLIB*H21.
FAC WARNING        C4020D0D4J00

BASG,T 2.

BASG,T 3.

BASG,T 4.

BASG,T 7.

BASG,T 10.

BASG,T 11.

BASG,T 13.

BASG,T 14.

BASG,T 15.

BACT SYSLIB*UG7.UG7

BART,V SYSLIB*H21.P21/02-1
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B L A C K & V E A T C H                                                              PROJECT 9457:      DATE 26 MAR 81   PAGE    5
***********************************************************************************************************************************
FLOOD HYDROGRAPH PACKAGE - HEC-1                                                     PROGRAM H21/C2-1V  TIME  08:46:00   CASE

*************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION        JULY 1978
  LAST MODIFICATION  01 APR 80
*************************************
                                MISSOURI DAM INSPECTIONS
                                LAKE CYRENE DAM
                                10 YEAR
                                                 JOB SPECIFICATION
                 NQ       NHR      NMIN     IDAY      IHR      IMIN    METRC     IPLT     IPRT    NSTAN
                288         0         5        0        0         0        0        0        3        0
                                             JOPER      NWT     LROPT    TRACE
                                                 5        0         0        0


          **********         **********         **********         **********         **********

                                              SUB-AREA RUNOFF COMPUTATION

                         COMPUTE INFLOW HYDROGRAPH

                                     ISTAQ     ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                                      HEAD         0        0        0        0        0        1        0        0
                                                          HYDROGRAPH DATA
                 IHYDG     IUHG     TAREA      SNAP     TRSDA     TRSPC     RATIO    ISNOW    ISAME    LOCAL
                     0        2       .19       .00       .19      1.00      .000        0        0        0

                                                            PRECIP DATA
                                                NP    STORM      DAJ       DAK
                                               288     5.21      .00       .00
                                                          PRECIP PATTERN
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .02        .02
          .02        .02        .02        .02        .02        .02        .02        .02        .02        .02
          .02        .02        .02        .02        .02        .02        .03        .03        .03        .03
          .03        .03        .04        .06        .06        .06        .06        .06        .06        .08
          .06        .15        .19        .37        .59        .26        .15        .08        .08        .08
          .06        .06        .06        .06        .06        .06        .03        .03        .03        .03
          .03        .03        .02        .02        .02        .02        .02        .02        .02        .02
          .02        .02        .02        .02        .02        .02        .02        .02        .02        .02
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
          .01        .01        .01        .01        .01        .01        .01        .01        .01        .01
```

.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01	.01	
.01	.01	.01	.01	.01	.01	.01		

LOSS DATA

LOSPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
2	.00	.00	1.00	.00	.00	1.00	-1.00	-82.00	.00	.00

CURVE NO = -82.00 WETNESS = -1.00 EFFECT CN = 82.00

UNIT HYDROGRAPH DATA
TC= .00 LAG= .20

RECESSION DATA
STRTQ= .00 QRCSN= .00 RTIOR= 1.00

UNIT HYDROGRAPH 14 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .20 VOL= 1.00

49.	161.	199.	159.	89.	51.	29.	17.	9.	5.			
3.	2.	1.	0.									

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.00	.00	.00	0.	1.01	12.05	145	.59	.45	.14	107.
1.01	.10	2	.00	.00	.00	0.	1.01	12.10	146	.24	.21	.05	102.
1.01	.15	3	.00	.00	.00	0.	1.01	12.15	147	.15	.12	.03	195.
1.01	.20	4	.00	.00	.00	0.	1.01	12.20	148	.09	.06	.01	147.
1.01	.25	5	.00	.00	.00	0.	1.01	12.25	149	.08	.06	.01	129.
1.01	.30	6	.00	.00	.00	0.	1.01	12.30	150	.08	.07	.01	57.
1.01	.35	7	.00	.00	.00	0.	1.01	12.35	151	.06	.05	.01	76.
1.01	.40	8	.00	.00	.00	0.	1.01	12.40	152	.06	.05	.01	62.
1.01	.45	9	.00	.00	.00	0.	1.01	12.45	153	.04	.05	.01	53.
1.01	.50	10	.00	.00	.00	0.	1.01	12.50	154	.06	.05	.01	47.
1.01	.55	11	.00	.00	.00	0.	1.01	12.55	155	.06	.05	.01	43.
1.01	1.00	12	.00	.00	.00	0.	1.01	13.00	156	.06	.05	.01	41.
1.01	1.05	13	.00	.00	.00	0.	1.01	13.05	157	.03	.02	.00	39.
1.01	1.10	14	.00	.00	.00	0.	1.01	13.10	158	.01	.02	.00	34.
1.01	1.15	15	.00	.00	.00	0.	1.01	13.15	159	.03	.02	.00	29.
1.01	1.20	16	.00	.00	.00	0.	1.01	13.20	160	.03	.02	.00	24.
1.01	1.25	17	.00	.00	.00	0.	1.01	13.25	161	.01	.02	.00	22.
1.01	1.30	18	.00	.00	.00	0.	1.01	13.30	162	.01	.02	.00	21.
1.01	1.35	19	.00	.00	.00	0.	1.01	13.35	163	.01	.01	.00	20.
1.01	1.40	20	.00	.00	.00	0.	1.01	13.40	164	.01	.01	.00	17.
1.01	1.45	21	.00	.00	.00	0.	1.01	13.45	165	.01	.01	.00	15.
1.01	1.50	22	.00	.00	.00	0.	1.01	13.50	166	.01	.01	.00	13.
1.01	1.55	23	.00	.00	.00	0.	1.01	13.55	167	.01	.01	.00	11.
1.01	2.00	24	.00	.00	.00	0.	1.01	14.00	168	.01	.01	.00	11.
1.01	2.05	25	.00	.00	.00	0.	1.01	14.05	169	.01	.01	.00	10.
1.01	2.10	26	.00	.00	.00	0.	1.01	14.10	170	.01	.01	.00	10.
1.01	2.15	27	.00	.00	.00	0.	1.01	14.15	171	.01	.01	.00	10.
1.01	2.20	28	.00	.00	.00	0.	1.01	14.20	172	.01	.01	.00	10.
1.01	2.25	29	.00	.00	.00	0.	1.01	14.25	173	.01	.01	.00	10.

1.01	2.30	30	.00	.00	.00	0.	1.01	14.30	174	.01	.01	.00	10.

	2.10	26	.00	.00	.00	C.	1.01	14.10	170	.01	.01	.00	10.
	2.15	27	.00	.00	.00	C.	1.01	14.15	171	.01	.01	.00	10.
1.01	2.20	28	.00	.00	.00	C.	1.01	14.20	172	.01	.01	.00	10.
1.01	2.25	29	.00	.00	.00	C.	1.01	14.25	173	.01	.01	.00	10.
1.01	2.30	30	.00	.00	.00	C.	1.01	14.30	174	.01	.01	.00	10.
1.01	2.35	31	.00	.00	.00	C.	1.01	14.35	175	.01	.01	.00	10.
1.01	2.40	32	.00	.00	.00	C.	1.01	14.40	176	.01	.01	.00	10.
1.01	2.45	33	.00	.00	.00	C.	1.01	14.45	177	.01	.01	.00	10.
1.01	2.50	34	.00	.00	.00	C.	1.01	14.50	178	.01	.01	.00	10.
1.01	2.55	35	.00	.00	.00	C.	1.01	14.55	179	.01	.01	.00	10.
1.01	3.00	36	.00	.00	.00	C.	1.01	15.00	180	.01	.01	.00	10.
1.01	3.05	37	.00	.00	.00	C.	1.01	15.05	181	.01	.01	.00	10.
1.01	3.10	38	.00	.00	.00	C.	1.01	15.10	182	.01	.01	.00	9.
1.01	3.15	39	.00	.00	.00	C.	1.01	15.15	183	.01	.01	.00	9.
1.01	3.20	40	.00	.00	.00	C.	1.01	15.20	184	.01	.01	.00	8.
1.01	3.25	41	.00	.00	.00	C.	1.01	15.25	185	.01	.01	.00	8.
1.01	3.30	42	.00	.00	.00	C.	1.01	15.30	186	.01	.01	.00	8.
1.01	3.35	43	.00	.00	.00	C.	1.01	15.35	187	.01	.01	.00	8.
1.01	3.40	44	.00	.00	.00	C.	1.01	15.40	188	.01	.01	.00	7.
1.01	3.45	45	.00	.00	.00	C.	1.01	15.45	189	.01	.01	.00	7.
1.01	3.50	46	.00	.00	.00	C.	1.01	15.50	190	.01	.01	.00	7.
1.01	3.55	47	.00	.00	.00	C.	1.01	15.55	191	.01	.01	.00	7.
1.01	4.00	48	.00	.00	.00	C.	1.01	16.00	192	.01	.01	.00	7.
1.01	4.05	49	.00	.00	.00	C.	1.01	16.05	193	.01	.01	.00	7.
1.01	4.10	50	.00	.00	.00	C.	1.01	16.10	194	.01	.01	.00	7.
1.01	4.15	51	.00	.00	.00	C.	1.01	16.15	195	.01	.01	.00	7.
1.01	4.20	52	.00	.00	.00	C.	1.01	16.20	196	.01	.01	.00	7.
1.01	4.25	53	.00	.00	.00	C.	1.01	16.25	197	.01	.01	.00	7.
1.01	4.30	54	.00	.00	.00	C.	1.01	16.30	198	.01	.01	.00	7.
1.01	4.35	55	.00	.00	.00	C.	1.01	16.35	199	.01	.01	.00	7.
1.01	4.40	56	.00	.00	.00	C.	1.01	16.40	200	.01	.01	.00	7.
1.01	4.45	57	.00	.00	.00	C.	1.01	16.45	201	.01	.01	.00	7.
1.01	4.50	58	.00	.00	.00	C.	1.01	16.50	202	.01	.01	.00	7.
1.01	4.55	59	.00	.00	.00	C.	1.01	16.55	203	.01	.01	.00	7.
1.01	5.00	60	.00	.00	.00	C.	1.01	17.00	204	.01	.01	.00	7.
1.01	5.05	61	.00	.00	.00	C.	1.01	17.05	205	.01	.01	.00	7.
1.01	5.10	62	.00	.00	.00	C.	1.01	17.10	206	.01	.01	.00	7.
1.01	5.15	63	.00	.00	.00	C.	1.01	17.15	207	.01	.01	.00	7.
1.01	5.20	64	.00	.00	.00	C.	1.01	17.20	208	.01	.01	.00	7.
1.01	5.25	65	.00	.00	.00	C.	1.01	17.25	209	.01	.01	.00	7.
1.01	5.30	66	.00	.00	.00	C.	1.01	17.30	210	.01	.01	.00	7.
1.01	5.35	67	.00	.00	.00	C.	1.01	17.35	211	.01	.01	.00	7.
1.01	5.40	68	.00	.00	.00	C.	1.01	17.40	212	.01	.01	.00	7.
1.01	5.45	69	.00	.00	.00	C.	1.01	17.45	213	.01	.01	.00	7.
1.01	5.50	70	.00	.00	.00	C.	1.01	17.50	214	.01	.01	.00	7.
1.01	5.55	71	.00	.00	.00	C.	1.01	17.55	215	.01	.01	.00	7.
1.01	6.00	72	.00	.00	.00	C.	1.01	18.00	216	.01	.01	.00	7.
1.01	6.05	73	.00	.00	.00	C.	1.01	18.05	217	.00	.00	.00	7.
1.01	6.10	74	.01	.01	.00	C.	1.01	18.10	218	.00	.00	.00	6.
1.01	6.15	75	.01	.01	.00	C.	1.01	18.15	219	.00	.00	.00	5.
1.01	6.20	76	.01	.01	.00	C.	1.01	18.20	220	.00	.00	.00	4.
1.01	6.25	77	.01	.01	.00	C.	1.01	18.25	221	.00	.00	.00	4.
1.01	6.30	78	.01	.01	.00	C.	1.01	18.30	222	.00	.00	.00	4.
1.01	6.35	79	.01	.01	.00	C.	1.01	18.35	223	.00	.00	.00	4.
1.01	6.40	80	.01	.01	.00	C.	1.01	18.40	224	.00	.00	.00	4.
1.01	6.45	81	.01	.01	.00	C.	1.01	18.45	225	.00	.00	.00	3.
1.01	6.50	82	.01	.01	.00	C.	1.01	18.50	226	.00	.00	.00	3.
1.01	6.55	83	.01	.01	.00	C.	1.01	18.55	227	.00	.00	.00	3.
1.01	7.00	84	.01	.01	.00	C.	1.01	19.00	228	.00	.00	.00	3.
1.01	7.05	85	.00	.00	.00	C.	1.01	19.05	229	.00	.00	.00	3.

1.01	7.10	86	.01	.00	.01	0.	1.01	17.10	270	.00	.00	.00	3.
1.01	7.15	87	.01	.00	.01	0.	1.01	19.15	271	.00	.00	.00	3.
1.01	7.20	88	.01	.00	.01	0.	1.01	19.20	272	.00	.00	.00	3.
1.01	7.25	89	.01	.00	.01	0.	1.01	19.25	273	.00	.00	.00	3.
1.01	7.30	90	.01	.00	.01	1.	1.01	19.30	274	.00	.00	.00	3.
1.01	7.35	91	.01	.00	.01	1.	1.01	19.35	275	.00	.00	.00	3.
1.01	7.40	92	.01	.00	.01	1.	1.01	19.40	276	.00	.00	.00	3.
1.01	7.45	93	.01	.00	.01	1.	1.01	19.45	277	.00	.00	.00	3.
1.01	7.50	94	.01	.00	.01	1.	1.01	19.50	278	.00	.00	.00	3.
1.01	7.55	95	.01	.00	.01	1.	1.01	19.55	279	.00	.00	.00	3.
1.01	8.00	96	.01	.00	.01	1.	1.01	20.00	280	.00	.00	.00	3.
1.01	8.05	97	.01	.00	.01	1.	1.01	20.05	281	.00	.00	.00	3.
1.01	8.10	98	.01	.00	.01	1.	1.01	20.10	282	.00	.00	.00	3.
1.01	8.15	99	.01	.00	.01	1.	1.01	20.15	283	.00	.00	.00	3.
1.01	8.20	100	.01	.00	.01	1.	1.01	20.20	284	.00	.00	.00	3.
1.01	8.25	101	.01	.00	.01	1.	1.01	20.25	285	.00	.00	.00	3.
1.01	8.30	102	.01	.00	.01	1.	1.01	20.30	286	.00	.00	.00	3.
1.01	8.35	103	.01	.00	.01	1.	1.01	20.35	287	.00	.00	.00	3.
1.01	8.40	104	.01	.00	.01	2.	1.01	20.40	288	.00	.00	.00	3.
1.01	8.45	105	.01	.00	.01	2.	1.01	20.45	289	.00	.00	.00	3.
1.01	8.50	106	.01	.00	.01	2.	1.01	20.50	290	.00	.00	.00	3.
1.01	8.55	107	.01	.00	.01	2.	1.01	20.55	291	.00	.00	.00	3.
1.01	9.00	108	.01	.00	.01	2.	1.01	21.00	292	.00	.00	.00	3.
1.01	9.05	109	.01	.00	.01	2.	1.01	21.05	293	.00	.00	.00	3.
1.01	9.10	110	.01	.00	.01	2.	1.01	21.10	294	.00	.00	.00	3.
1.01	9.15	111	.01	.00	.01	2.	1.01	21.15	295	.00	.00	.00	3.
1.01	9.20	112	.01	.00	.01	3.	1.01	21.20	296	.00	.00	.00	3.
1.01	9.25	113	.01	.00	.01	3.	1.01	21.25	297	.00	.00	.00	3.
1.01	9.30	114	.01	.00	.01	3.	1.01	21.30	298	.00	.00	.00	3.
1.01	9.35	115	.01	.00	.01	3.	1.01	21.35	299	.00	.00	.00	3.
1.01	9.40	116	.01	.00	.01	3.	1.01	21.40	300	.00	.00	.00	3.
1.01	9.45	117	.01	.00	.01	3.	1.01	21.45	301	.00	.00	.00	3.
1.01	9.50	118	.01	.00	.01	3.	1.01	21.50	302	.00	.00	.00	3.
1.01	9.55	119	.01	.00	.01	3.	1.01	21.55	303	.00	.00	.00	3.
1.01	10.00	120	.01	.00	.01	4.	1.01	22.00	304	.00	.00	.00	3.
1.01	10.05	121	.01	.00	.01	4.	1.01	22.05	305	.00	.00	.00	3.
1.01	10.10	122	.01	.00	.01	4.	1.01	22.10	306	.00	.00	.00	3.
1.01	10.15	123	.01	.00	.01	4.	1.01	22.15	307	.00	.00	.00	3.
1.01	10.20	124	.01	.00	.01	4.	1.01	22.20	308	.00	.00	.00	3.
1.01	10.25	125	.01	.00	.01	4.	1.01	22.25	309	.00	.00	.00	3.
1.01	10.30	126	.01	.00	.01	4.	1.01	22.30	310	.00	.00	.00	3.
1.01	10.35	127	.01	.00	.02	4.	1.01	22.35	311	.00	.00	.00	3.
1.01	10.40	128	.01	.00	.02	5.	1.01	22.40	312	.00	.00	.00	3.
1.01	10.45	129	.01	.00	.02	6.	1.01	22.45	313	.00	.00	.00	3.
1.01	10.50	130	.01	.00	.02	6.	1.01	22.50	314	.00	.00	.00	3.
1.01	10.55	131	.01	.00	.02	8.	1.01	22.55	315	.00	.00	.00	3.
1.01	11.00	132	.01	.00	.02	9.	1.01	23.00	316	.00	.00	.00	3.
1.01	11.05	133	.01	.00	.03	10.	1.01	23.05	317	.00	.00	.00	3.
1.01	11.10	134	.01	.00	.03	12.	1.01	23.10	318	.00	.00	.00	3.
1.01	11.15	135	.01	.00	.03	16.	1.01	23.15	319	.00	.00	.00	3.
1.01	11.20	136	.01	.00	.03	18.	1.01	23.20	320	.00	.00	.00	3.
1.01	11.25	137	.01	.00	.03	20.	1.01	23.25	321	.00	.00	.00	3.
1.01	11.30	138	.01	.00	.03	22.	1.01	23.30	322	.00	.00	.00	3.
1.01	11.35	139	.01	.00	.03	24.	1.01	23.35	323	.00	.00	.00	3.
1.01	11.40	140	.01	.00	.03	27.	1.01	23.40	324	.00	.00	.00	3.
1.01	11.45	141	.01	.00	.03	30.	1.01	23.45	325	.00	.00	.00	3.

1.01	11.50	142	.15	.09	.06	35.	1.01	23.50	326	.00	.00	.00	3.

1.01	11.50	142	.15	.09	.06	35.	1.01	23.50	286	.00	.00	.00	3.
1.01	11.55	143	.15	.10	.05	44.	1.01	23.55	287	.00	.00	.00	3.
1.01	12.00	144	.37	.26	.11	63.	1.02	.00	288	.00	.00	.00	3.
								SUM	5.21	3.27	1.94	2401.	
									(132.3)(	83.3)(	49.3)(	70.25)	

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	195.	27.	9.	9.	2520.
CMS	5.	1.	0.	0.	71.
INCHES		2.09	3.26	3.26	3.26
HA		87.60	82.20	82.20	82.20
AC-FT		14.	17.	17.	17.
THOUS CU M		17.	21.	21.	21.

****

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPPP	LSTR
.0	.000	.03	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	.000	.000	.000	-664.	-1

STAGE	664.00	664.50	665.00	666.00	667.00	668.00	669.00	690.00	692.00
FLOW	.00	11.00	26.00	72.00	149.00	278.00	434.00	825.00	1050.00
SURFACE AREA=	0.	6.	8.	12.					
CAPACITY=	0.	50.	93.	192.					
ELEVATION=	660.	664.	665.	700.					

CREL	SPWID	COOD	EXPW	ELEVL	COOL	CAREA	EXPL
675.0	.0	.0	.0	.0	.0	.0	.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
695.5	.0	.0	0.

CREST LENGTH	150.	210.	760.	540.	650.	650.
FLOW AT DESIGN ELEVATION	695.5	695.7	696.3	696.3	696.3	696.0

END-OF-PERIOD HYDROGRAPH ORDINATES

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.05	1	.08	0.	0.	50.	6P4.0
1.01	.10	2	.17	0.	0.	50.	6P4.0
1.01	.15	3	.25	0.	0.	50.	6P4.0
1.01	.20	4	.33	0.	0.	50.	6P4.0
1.01	.25	5	.42	0.	0.	50.	6P4.0
1.01	.30	6	.50	0.	0.	50.	6P4.0
1.01	.35	7	.58	0.	0.	50.	6P4.0
1.01	.40	8	.67	0.	0.	50.	6P4.0
1.01	.45	9	.75	0.	0.	50.	6P4.0
1.01	.50	10	.83	0.	0.	50.	6P4.0
1.01	.55	11	.92	0.	0.	50.	6P4.0
1.01	1.00	12	1.00	0.	0.	50.	6P4.0
1.01	1.05	13	1.08	0.	0.	50.	6P4.0
1.01	1.10	14	1.17	0.	0.	50.	6P4.0
1.01	1.15	15	1.25	0.	0.	50.	6P4.0
1.01	1.20	16	1.33	0.	0.	50.	6P4.0
1.01	1.25	17	1.42	0.	0.	50.	6P4.0
1.01	1.30	18	1.50	0.	0.	50.	6P4.0
1.01	1.35	19	1.58	0.	0.	50.	6P4.0
1.01	1.40	20	1.67	0.	0.	50.	6P4.0
1.01	1.45	21	1.75	0.	0.	50.	6P4.0
1.01	1.50	22	1.83	0.	0.	50.	6P4.0
1.01	1.55	23	1.92	0.	0.	50.	6P4.0
1.01	2.00	24	2.00	0.	0.	50.	6P4.0
1.01	2.05	25	2.08	0.	0.	50.	6P4.0
1.01	2.10	26	2.17	0.	0.	50.	6P4.0
1.01	2.15	27	2.25	0.	0.	50.	6P4.0
1.01	2.20	28	2.33	0.	0.	50.	6P4.0
1.01	2.25	29	2.42	0.	0.	50.	6P4.0
1.01	2.30	30	2.50	0.	0.	50.	6P4.0
1.01	2.35	31	2.58	0.	0.	50.	6P4.0
1.01	2.40	32	2.67	0.	0.	50.	6P4.0
1.01	2.45	33	2.75	0.	0.	50.	6P4.0
1.01	2.50	34	2.83	0.	0.	50.	6P4.0
1.01	2.55	35	2.92	0.	0.	50.	6P4.0
1.01	3.00	36	3.00	0.	0.	50.	6P4.0
1.01	3.05	37	3.08	0.	0.	50.	6P4.0
1.01	3.10	38	3.17	0.	0.	50.	6P4.0
1.01	3.15	39	3.25	0.	0.	50.	6P4.0
1.01	3.20	40	3.33	0.	0.	50.	6P4.0
1.01	3.25	41	3.42	0.	0.	50.	6P4.0
1.01	3.30	42	3.50	0.	0.	50.	6P4.0
1.01	3.35	43	3.58	0.	0.	50.	6P4.0
1.01	3.40	44	3.67	0.	0.	50.	6P4.0
1.01	3.45	45	3.75	0.	0.	50.	6P4.0
1.01	3.50	46	3.83	0.	0.	50.	6P4.0
1.01	3.55	47	3.92	0.	0.	50.	6P4.0
1.01	4.00	48	4.00	0.	0.	50.	6P4.0
1.01	4.05	49	4.08	0.	0.	50.	6P4.0
1.01	4.10	50	4.17	0.	0.	50.	6P4.0
1.01	4.15	51	4.25	0.	0.	50.	6P4.0
1.01	4.20	52	4.33	0.	0.	50.	6P4.0
1.01	4.25	53	4.42	0.	0.	50.	6P4.0
1.01	4.30	54	4.50	0.	0.	50.	6P4.0

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	4.35	55	4.58	0.	0.	50.	6P4.0

1.01	4.15	50	4.17	0.	0.	50.	6P4.0	
1.01	4.19	51	4.25	0.	0.	50.	6P4.0	
1.01	4.20	52	4.33	0.	0.	50.	6P4.0	
1.01	4.25	53	4.42	0.	0.	50.	6P4.0	
1.01	4.30	54	4.50	0.	0.	50.	6P4.0	

1.01	4.35	55	4.58	0.	0.	50.	6P4.0
1.01	4.40	56	4.67	0.	0.	50.	6P4.0
1.01	4.45	57	4.75	0.	0.	50.	6P4.0
1.01	4.50	58	4.83	0.	0.	50.	6P4.0
1.01	4.55	59	4.92	0.	0.	50.	6P4.0
1.01	5.00	60	5.00	0.	0.	50.	6P4.0
1.01	5.05	61	5.08	0.	0.	50.	6P4.0
1.01	5.10	62	5.17	0.	0.	50.	6P4.0
1.01	5.15	63	5.25	0.	0.	50.	6P4.0
1.01	5.20	64	5.33	0.	0.	50.	6P4.0
1.01	5.25	65	5.42	0.	0.	50.	6P4.0
1.01	5.30	66	5.50	0.	0.	50.	6P4.0
1.01	5.35	67	5.58	0.	0.	50.	6P4.0
1.01	5.40	68	5.67	0.	0.	50.	6P4.0
1.01	5.45	69	5.75	0.	0.	50.	6P4.0
1.01	5.50	70	5.83	0.	0.	50.	6P4.0
1.01	5.55	71	5.92	0.	0.	50.	6P4.0
1.01	6.00	72	6.00	0.	0.	50.	6P4.0
1.01	6.05	73	6.08	0.	0.	50.	6P4.0
1.01	6.10	74	6.17	0.	0.	50.	6P4.0
1.01	6.15	75	6.25	0.	0.	50.	6P4.0
1.01	6.20	76	6.33	0.	0.	50.	6P4.0
1.01	6.25	77	6.42	0.	0.	50.	6P4.0
1.01	6.30	78	6.50	0.	0.	50.	6P4.0
1.01	6.35	79	6.58	0.	0.	50.	6P4.0
1.01	6.40	80	6.67	0.	0.	50.	6P4.0
1.01	6.45	81	6.75	0.	0.	50.	6P4.0
1.01	6.50	82	6.83	0.	0.	50.	6P4.0
1.01	6.55	83	6.92	0.	0.	50.	6P4.0
1.01	7.00	84	7.00	0.	0.	50.	6P4.0
1.01	7.05	85	7.08	0.	0.	50.	6P4.0
1.01	7.10	86	7.17	0.	0.	50.	6P4.0
1.01	7.15	87	7.25	0.	0.	50.	6P4.0
1.01	7.20	88	7.33	0.	0.	50.	6P4.0
1.01	7.25	89	7.42	0.	0.	50.	6P4.0
1.01	7.30	90	7.50	1.	0.	50.	6P4.0
1.01	7.35	91	7.58	1.	0.	50.	6P4.0
1.01	7.40	92	7.67	1.	0.	50.	6P4.0
1.01	7.45	93	7.75	1.	0.	50.	6P4.0
1.01	7.50	94	7.83	1.	0.	50.	6P4.0
1.01	7.55	95	7.92	1.	0.	50.	6P4.0
1.01	8.00	96	8.00	1.	0.	50.	6P4.0
1.01	8.05	97	8.08	1.	0.	50.	6P4.0
1.01	8.10	98	8.17	1.	0.	50.	6P4.0
1.01	8.15	99	8.25	1.	0.	50.	6P4.0
1.01	8.20	100	8.33	1.	0.	50.	6P4.0
1.01	8.25	101	8.42	1.	0.	50.	6P4.0
1.01	8.30	102	8.50	1.	0.	50.	6P4.0
1.01	8.35	103	8.58	1.	0.	50.	6P4.0
1.01	8.40	104	8.67	2.	0.	50.	6P4.0
1.01	8.45	105	8.75	2.	0.	51.	6P4.0
1.01	8.50	106	8.83	2.	0.	51.	6P4.0
1.01	8.55	107	8.92	2.	0.	51.	6P4.0
1.01	9.00	108	9.00	2.	0.	51.	6P4.0
1.01	9.05	109	9.08	2.	0.	51.	6P4.0
1.01	9.10	110	9.17	2.	1.	51.	6P4.0

1.01	9.15	111	9.25	2.	1.	51.	6F4.0	
1.01	9.20	112	9.33	3.	1.	51.	6F4.0	
1.01	9.25	113	9.42	3.	1.	51.	6F4.0	
1.01	9.30	114	9.50	3.	1.	51.	6F4.0	
1.01	9.35	115	9.58	3.	1.	51.	6F4.0	
1.01	9.40	116	9.67	3.	1.	51.	6F4.0	
1.01	9.45	117	9.75	3.	1.	51.	6F4.0	
1.01	9.50	118	9.83	3.	1.	51.	6F4.0	
1.01	9.55	119	9.92	3.	1.	51.	6F4.0	
1.01	10.00	120	10.00	4.	1.	51.	6F4.0	
1.01	10.05	121	10.08	4.	1.	51.	6F4.1	
1.01	10.10	122	10.17	4.	1.	51.	6F4.1	
1.01	10.15	123	10.25	4.	1.	51.	6F4.1	
1.01	10.20	124	10.33	4.	1.	51.	6F4.1	
1.01	10.25	125	10.42	4.	1.	51.	6F4.1	
1.01	10.30	126	10.50	4.	1.	51.	6F4.1	
1.01	10.35	127	10.58	4.	1.	51.	6F4.1	
1.01	10.40	128	10.67	5.	2.	51.	6F4.1	
1.01	10.45	129	10.75	6.	2.	51.	6F4.1	
1.01	10.50	130	10.83	8.	2.	51.	6F4.1	
1.01	10.55	131	10.92	8.	2.	51.	6F4.1	
1.01	11.00	132	11.00	9.	2.	51.	6F4.1	
1.01	11.05	133	11.08	10.	2.	51.	6F4.1	
1.01	11.10	134	11.17	12.	2.	51.	6F4.1	
1.01	11.15	135	11.25	14.	3.	51.	6F4.1	
1.01	11.20	136	11.33	18.	3.	51.	6F4.1	
1.01	11.25	137	11.42	25.	3.	51.	6F4.2	
1.01	11.30	138	11.50	22.	4.	52.	6F4.2	
1.01	11.35	139	11.58	24.	4.	52.	6F4.2	
1.01	11.40	140	11.67	27.	5.	52.	6F4.2	
1.01	11.45	141	11.75	30.	6.	52.	6F4.2	
1.01	11.50	142	11.83	35.	6.	52.	6F4.3	
1.01	11.55	143	11.92	44.	7.	52.	6F4.3	
1.01	12.00	144	12.00	65.	8.	53.	6F4.4	
1.01	12.05	145	12.08	107.	10.	54.	6F4.4	
1.01	12.10	146	12.17	162.	11.	54.	6F4.6	
1.01	12.15	147	12.25	165.	19.	55.	6F4.7	
1.01	12.20	148	12.33	167.	23.	56.	6F4.9	
1.01	12.25	149	12.42	129.	27.	57.	6F5.0	
1.01	12.30	150	12.50	97.	31.	58.	6F5.1	
1.01	12.35	151	12.58	76.	34.	58.	6F5.2	
1.01	12.40	152	12.67	62.	36.	58.	6F5.2	
1.01	12.45	153	12.75	53.	37.	58.	6F5.2	
1.01	12.50	154	12.83	47.	37.	58.	6F5.2	
1.01	12.55	155	12.92	43.	38.	59.	6F5.3	
1.01	13.00	156	13.00	41.	38.	59.	6F5.3	
1.01	13.05	157	13.08	39.	38.	59.	6F5.3	
1.01	13.10	158	13.17	34.	38.	59.	6F5.3	
1.01	13.15	159	13.25	29.	38.	59.	6F5.3	
1.01	13.20	160	13.33	24.	37.	58.	6F5.2	
1.01	13.25	161	13.42	22.	36.	58.	6F5.2	
1.01	13.30	162	13.50	21.	36.	58.	6F5.2	
1.01	13.35	163	13.58	20.	35.	58.	6F5.2	
1.01	13.40	164	13.67	17.	34.	58.	6F5.2	
1.01	13.45	165	13.75	15.	33.	58.	6F5.2	
1.01	13.50	166	13.83	13.	32.	58.	6F5.1	

1.01	13.55	167	13.92	11.	31.	58.	6F5.1	

1.01	13.35	162	13.58	20.	35.	5R.	6P5.2	
1.01	13.40	163	13.67	17.	34.	5R.	6P5.2	
1.01	13.45	165	13.75	15.	33.	5R.	6P5.2	
1.01	13.50	166	13.83	13.	32.	5R.	6P5.1	

1.01	13.55	167	13.92	11.	31.	5R.	6P5.1
1.01	14.00	168	14.00	11.	31.	57.	6P5.1
1.01	14.05	169	14.08	10.	30.	57.	6P5.1
1.01	14.10	170	14.17	10.	29.	57.	6P5.1
1.01	14.15	171	14.25	10.	28.	57.	6P5.0
1.01	14.20	172	14.33	10.	27.	57.	6P5.0
1.01	14.25	173	14.42	10.	26.	57.	6P5.0
1.01	14.30	174	14.50	10.	26.	57.	6P5.0
1.01	14.35	175	14.58	10.	25.	57.	6P5.0
1.01	14.40	176	14.67	10.	25.	57.	6P5.0
1.01	14.45	177	14.75	10.	24.	56.	6P4.9
1.01	14.50	178	14.83	10.	24.	56.	6P4.9
1.01	14.55	179	14.92	10.	23.	56.	6P4.9
1.01	15.00	180	15.00	10.	23.	56.	6P4.9
1.01	15.05	181	15.08	10.	23.	56.	6P4.9
1.01	15.10	182	15.17	9.	22.	56.	6P4.9
1.01	15.15	183	15.25	9.	22.	56.	6P4.9
1.01	15.20	184	15.33	8.	21.	56.	6P4.8
1.01	15.25	185	15.42	8.	21.	56.	6P4.8
1.01	15.30	186	15.50	8.	21.	56.	6P4.8
1.01	15.35	187	15.58	8.	20.	56.	6P4.8
1.01	15.40	188	15.67	7.	20.	55.	6P4.8
1.01	15.45	189	15.75	7.	19.	55.	6P4.8
1.01	15.50	190	15.83	7.	19.	55.	6P4.8
1.01	15.55	191	15.92	7.	19.	55.	6P4.8
1.01	16.00	192	16.00	7.	18.	55.	6P4.7
1.01	16.05	193	16.08	7.	18.	55.	6P4.7
1.01	16.10	194	16.17	7.	18.	55.	6P4.7
1.01	16.15	195	16.25	7.	17.	55.	6P4.7
1.01	16.20	196	16.33	7.	17.	55.	6P4.7
1.01	16.25	197	16.42	7.	17.	55.	6P4.7
1.01	16.30	198	16.50	7.	16.	55.	6P4.7
1.01	16.35	199	16.58	7.	16.	55.	6P4.7
1.01	16.40	200	16.67	7.	16.	55.	6P4.7
1.01	16.45	201	16.75	7.	16.	55.	6P4.7
1.01	16.50	202	16.83	7.	15.	55.	6P4.6
1.01	16.55	203	16.92	7.	15.	54.	6P4.6
1.01	17.00	204	17.00	7.	15.	54.	6P4.6
1.01	17.05	205	17.08	7.	15.	54.	6P4.6
1.01	17.10	206	17.17	7.	14.	54.	6P4.6
1.01	17.15	207	17.25	7.	14.	54.	6P4.6
1.01	17.20	208	17.33	7.	14.	54.	6P4.6
1.01	17.25	209	17.42	7.	14.	54.	6P4.6
1.01	17.30	210	17.50	7.	14.	54.	6P4.6
1.01	17.35	211	17.58	7.	13.	54.	6P4.6
1.01	17.40	212	17.67	7.	13.	54.	6P4.6
1.01	17.45	213	17.75	7.	13.	54.	6P4.6
1.01	17.50	214	17.83	7.	13.	54.	6P4.6
1.01	17.55	215	17.92	7.	13.	54.	6P4.6
1.01	18.00	216	18.00	7.	13.	54.	6P4.6
1.01	18.05	217	18.08	7.	12.	54.	6P4.5
1.01	18.10	218	18.17	6.	12.	54.	6P4.5
1.01	18.15	219	18.25	6.	12.	54.	6P4.5
1.01	18.20	220	18.33	6.	12.	54.	6P4.5
1.01	18.25	221	18.42	6.	12.	54.	6P4.5
1.01	18.30	222	18.50	6.	11.	54.	6P4.5

1.01	18.35	223	18.38	4.	11.	54.	6P4.5	
1.01	18.40	224	18.67	4.	11.	54.	6P4.5	
1.01	18.45	225	18.75	3.	11.	54.	6P4.5	
1.01	18.50	226	18.83	3.	11.	53.	6P4.5	
1.01	18.55	227	18.92	3.	10.	53.	6P4.5	
1.01	19.00	228	19.00	3.	10.	53.	6P4.5	
1.01	19.05	229	19.08	3.	10.	53.	6P4.5	
1.01	19.10	230	19.17	3.	10.	53.	6P4.5	
1.01	19.15	231	19.25	3.	10.	53.	6P4.4	
1.01	19.20	232	19.33	3.	10.	53.	6P4.4	
1.01	19.25	233	19.42	3.	9.	53.	6P4.4	
1.01	19.30	234	19.50	3.	9.	53.	6P4.4	
1.01	19.35	235	19.58	3.	9.	53.	6P4.4	
1.01	19.40	236	19.67	3.	9.	53.	6P4.4	
1.01	19.45	237	19.75	3.	9.	53.	6P4.4	
1.01	19.50	238	19.83	3.	9.	53.	6P4.4	
1.01	19.55	239	19.92	3.	9.	53.	6P4.4	
1.01	20.00	240	20.00	3.	9.	53.	6P4.4	
1.01	20.05	241	20.08	3.	8.	53.	6P4.4	
1.01	20.10	242	20.17	3.	8.	53.	6P4.4	
1.01	20.15	243	20.25	3.	8.	53.	6P4.4	
1.01	20.20	244	20.33	3.	8.	53.	6P4.4	
1.01	20.25	245	20.42	3.	8.	53.	6P4.4	
1.01	20.30	246	20.50	3.	8.	53.	6P4.4	
1.01	20.35	247	20.58	3.	8.	53.	6P4.4	
1.01	20.40	248	20.67	3.	8.	53.	6P4.4	
1.01	20.45	249	20.75	3.	8.	53.	6P4.3	
1.01	20.50	250	20.83	3.	8.	53.	6P4.3	
1.01	20.55	251	20.92	3.	7.	53.	6P4.3	
1.01	21.00	252	21.00	3.	7.	53.	6P4.3	
1.01	21.05	253	21.08	3.	7.	52.	6P4.3	
1.01	21.10	254	21.17	3.	7.	52.	6P4.3	
1.01	21.15	255	21.25	3.	7.	52.	6P4.3	
1.01	21.20	256	21.33	3.	7.	52.	6P4.3	
1.01	21.25	257	21.42	3.	7.	52.	6P4.3	
1.01	21.30	258	21.50	3.	7.	52.	6P4.3	
1.01	21.35	259	21.58	3.	7.	52.	6P4.3	
1.01	21.40	260	21.67	3.	7.	52.	6P4.3	
1.01	21.45	261	21.75	3.	7.	52.	6P4.3	
1.01	21.50	262	21.83	3.	7.	52.	6P4.3	
1.01	21.55	263	21.92	3.	6.	52.	6P4.3	
1.01	22.00	264	22.00	3.	6.	52.	6P4.3	
1.01	22.05	265	22.08	3.	6.	52.	6P4.3	
1.01	22.10	266	22.17	3.	6.	52.	6P4.3	
1.01	22.15	267	22.25	3.	6.	52.	6P4.3	
1.01	22.20	268	22.33	3.	6.	52.	6P4.3	
1.01	22.25	269	22.42	3.	6.	52.	6P4.3	
1.01	22.30	270	22.50	3.	6.	52.	6P4.3	
1.01	22.35	271	22.58	3.	6.	52.	6P4.3	
1.01	22.40	272	22.67	3.	6.	52.	6P4.3	
1.01	22.45	273	22.75	3.	6.	52.	6P4.3	
1.01	22.50	274	22.83	3.	6.	52.	6P4.3	
1.01	22.55	275	22.92	3.	6.	52.	6P4.3	
1.01	23.00	276	23.00	3.	6.	52.	6P4.3	
1.01	23.05	277	23.08	3.	6.	52.	6P4.3	
1.01	23.10	278	23.17	3.	6.	52.	6P4.3	

1.01	23.15	279	23.25	3.	6.	52.	6P4.3	

1.01	22.58	275	22.92	3.	6.	52.	6P4.3
1.01	23.04	276	23.00	3.	6.	52.	6P4.3
1.01	23.08	277	23.08	3.	6.	52.	6P4.3
1.01	23.13	278	23.17	3.	6.	52.	6P4.3

1.01	23.15	279	23.25	3.	6.	52.	6P4.3
1.01	23.20	280	23.33	3.	5.	52.	6P4.2
1.01	23.25	281	23.42	3.	5.	52.	6P4.2
1.01	23.31	282	23.50	3.	5.	52.	6P4.2
1.01	23.35	283	23.58	3.	5.	52.	6P4.2
1.01	23.40	284	24.07	3.	5.	52.	6P4.2
1.01	23.45	285	24.15	3.	5.	52.	6P4.2
1.01	23.50	286	24.23	3.	5.	52.	6P4.2
1.01	23.55	287	24.32	3.	5.	52.	6P4.2
1.01	24.00	288	24.40	3.	5.	52.	6P4.2

PEAK OUTFLOW IS 3. AT TIME 13.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38.	23.	8.	8.	2315.
CMS	1.	1.	0.	0.	66.
INCHES		2.17	2.99	2.99	2.99
MM		55.04	75.97	75.97	75.97
AC-FT		14.	16.	16.	16.
THOUS CU M		14.	20.	20.	20.

RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	HEAD	185.	29.	9.	9.	.10
	(	5.25)(	.81)(	.25)(	.25)(	.26)
ROUTED TO	DAM	35.	23.	8.	8.	.10
	(	1.07)(	.66)(	.23)(	.23)(	.26)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	6P4.CC	6P4.CO	6P5.5?
STORAGE	50.	5C.	6C.
OUTFLOW	0.	0.	49.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
10-year ~~1.00~~	6P5.24	.60	59.	38.	.00	13.0P	.00

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